# GEOGRAPHIC VARIATION AND TAXONOMY OF NORTH AMERICAN SPECIES OF MIRABILIS, SECTION OXYBAPHOIDES (NYCTAGINACEAE) 

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#### Abstract

A revision of Mirabilis, section Oxybaphoides, Nyctaginaceae, in western North America is presented Mirabilis oligantha (Standl.) J.F. Macbride, M. oxybaphoides (A. Gray) A. Gray, and M. tenuiloba S. Wats. remain as traditionally classified. Mirabilis bigelovii A. Gray, M. californica A. Gray ex Torr., M. laevis (Benth.) Curran, and M. retrorsa Heller are combined as a single species, M. laevis, and recognized as varieties, i.e., M. laevis var. villosa (Kellogg) Spellenb. (comb. nov.), M. laevis var. crassifolia (Choisy) Spellenb. (comb. nov.), M. laevis var. laevis, and M. laevis var. retrorsa (Heller) Jepson, respectively. Distribution maps are presented for each species, those for the varieties within the $M$. laevis complex also indicating geographic distribution of characters. The inspection of these maps was of importance in making taxonomic decisions. Lists of important collections are provided. Chromosome numbers are reported for the first time for M. laevis var. villosa $\left(2 n=30_{\| 1}\right)$, M. laevis var. retrorsa ( $2 n=31-33_{\| 1}$ ) and M. oxybaphoides $\left(2 n=30_{\| 1}\right)$.


## RESUMEN

Se presenta una revisión de Mirabilis, sección Oxybaphoides, Nyctaginaceae, en el oeste de Norte América. Mirabilisoligantha (Standl.) J.F. Macbride, M. oxybaphoides(A. Gray) A. Gray, y M.tenuiloba S. Wats. permanecen tal como se clasificaban tradicionalmente. Mirabilis bigelovii A. Gray, M. californica A. Gray ex Torr., M. laevis (Benth.) Curran, y M. retrorsa Heller se combinan como una única especie, M. laevis, y reconocidas como variedades, i.e., M. laevis var. villosa (Kellogg) Spellenb. (comb. nov.), M. laevis var. crassifolia (Choisy) Spellenb. (comb. nov.), M. laevis var. laevis, y M. laevis var. retrorsa (Heller) Jepson, respectivamente. Se presentan mapas de distribución de todas las especies, y de las variedades en el complejo $M$. laevis indicando también la distribución geográfica de los caracteres. El estudio de estos mapas fue muy importante para tomar las decisiones taxonómicas. Se of recen listas de colecciones importantes. Se citan por primera vez números cromosomáticos de $M$. laevis var. villosa $\left(2 n=30_{\text {II }}\right)$, M. laevis var. retrorsa $\left(2 n=31-33_{\mathrm{HI}}\right)$ y M. oxybaphoides $\left(2 n=30_{\mathrm{HI}}\right)$.

## INTRODUCTION

Mirabilis L. is primarily a New World genus comprising 45-60 species distributed from southern Canada to southern South America, with one native to southern Asia (Bogle 1974; Heimerl 1934; Le Duc 1995). Species have been suspected of hybridization (Shinners 1951). In addition, some are known to be autogamous and even cleistogamous (Cruden 1973). Stamens and style curl tightly together in flowers of the species treated here, as in other arid-land Mirabilis in

[^0]southwestern North America, probably effecting self-pollination as observed in Boerhavia (Chaturvedi 1989; Spellenberg 2001), species in other Mirabilis sections (Cruden 1973; Hernández 1990), and several other genera (Spellenberg \& Delson 1977). Coupling hybridization with autogamy may produce individually rather uniform populations, but geographically complex variation patterns (Stebbins 1957).

Such complexes provided fertile ground for the description of numerous entities under taxonomic traditions of early in the $20^{\text {th }}$ century, in which, because of locally uniform populations but widespread variation across a geographic region, taxonomic decisions may be subjective and perhaps utilitarian, following a philosophy expressed by Lewis (1963). Here, for example, more than 40 synonyms apply to our concept of Mirabilis laevis (Benth.) Curran and varieties. The taxonomic problems associated with Mirabilis were commented upon by Shinners (1951, p. 173) ("Mirabilis is surely one of the most troublesome of Southwestern genera, in nomenclature and taxonomy both.") and by Standley (1931a, p. 73) after several decades of study in the family ("I know of few groups of plants [Neea, Torrubia, Mirabilis] in which specific differences are so unstable and so baffling[;] ... no single character seems to be constant.") Turner (1993), conversely, in a rather refreshing approach to the taxonomy of the genus, noted that if emphasis on vegetative variation were minimized, and fruit characteristics were emphasized instead, the genus in Texas was taxonomically tractable.

Mirabilis was divided into six sections by Heimerl (1934; translated in part and reviewed in Le Duc 1995), one of which, Oxybaphoides A. Gray, was characterized by slightly accrescent involucres and fruits that are comparatively small and unornamented (Fig. 1). Heimerl included in it the North American species M. oxybaphoides (A. Gray) A. Gray, M. californica A. Gray (and close allies), a number of South American species, and one southern Asian species.

Mirabilis oxybaphoides has presented little taxonomic controversy at the species level since its description by Gray (1853) in the genus Quamoclidion. It is sufficiently distinct from other species of Mirabilis (as the genus is now generally construed) that it formed the monotypic genus Allioniella of Rydberg (1902). This classification was followed by Standley $(1909,1918)$ in several treatments of the family, but he was apparently unaware of its presence in Mexico, as it was not included in his treatment of the family for that nation (Standley 1911).

The remaining taxa of the section in North America were placed in a new genus Hesperonia by Standley (1909), who emphasized differences of fruit form, shape of the perianth, and number of flowers in the involucre. Standley recognized eight species and several subspecies, emphasizing shape, color, size of the fruit, and vegetative characters such as plant size, leave size and shape, and characteristics of vestiture. Jepson (1914) treated this as subgenus Hesperonia (Standl.) Jepson, including M. californica and M. tenuiloba S. Wats., noting also


FIg. 1.Variation in fruits of Nyctaginaceae, section Oxybaphoides, in North America. Fruits are grouped by taxon (Mirabilis laevis,M. oligantha, M. oxybaphoides,M. tenuiloba).Those above the line "leavis" refer to varieties within M. Iaevis. Fruit above letter N is 7.5 mm long. Each letter refers to a fruit from a different collection. Collections, fully cited in Appendix 2 are identified by asterisk (*) following herbarium of deposition, are: A, Brandegee s.n.; B, Palmer 886 ; C, Blakley 5657 ; D. Spellenberg 12336; E. Spellenberg 12335; F, Spellenberg 5444;G, Spellenberg 2982; H, Spellenberg 10206;I, Spellenberg 12332;J,Barneby 18303;K,Spellenberg 12342;L., Spellenberg 12329;M, Eastwood 18313;N, Wiggins \& Wiggins 15940;0, Gentry \& Fox 11731; P, Moran 23808; Q, Johnston \& Muller 603; R, Waterfall 12142; S, Columbus 637; T, Correll \& Johnston 24516; U, Powell \& B. L. Turner 1708; V, Wiggins \& Wiggins 15863; W, Brandegee s.n.
that M. laevis and M. cedrosensis (Standl.) Jepson were closely related if not the same as M. californica. Standley (1931b), upon completing studies of South American Nyctaginaceae, noted that characteristics used to distinguish North American genera allied to Mirabilis did not do so and also chose to unite all in an inclusive Mirabilis, a classification followed by most botanists since then. Of those taxa early placed in Hesperonia as they are recognized here, M. oligantha (Standl.) J.F. Macbride remains poorly known, M. tenuiloba has presented very few problems, but M. laevis has been a source of a plethora of names as taxonomists have attempted to deal with the variation presented by populations in the complex. The high points of these taxonomic meanderings are discussed under each of the taxa below.

Recently Le Duc (1993) described Mirabilis russellii Le Duc from the west coast of Mexico, placing the new species in the section Oxybaphoides because of its suffrutescent nature, campanulate perianth, and mucilaginous anthocarp (when wet). It rests very poorly in this section primarily because of general habit and anthocarp morphology. The single immature anthocarp available to us on the paratype at NMC generally resembles anthocarps of several other Mexican Mirabilissuch as M. sanguinea Heimerl, M. hintoniorum Le Duc, and M. urbanii Heimerl, as figured
in Le Duc's (1995) plate II. For the present treatment of section Oxybaphoides we exclude the species and suggest it lies more comfortably in section Mirabilis.

In this paper we examine the geographic variation and taxonomy of the most complex species in the section in North America, Mirabilis laevis, and we provide a key, descriptions, and distribution maps for the other three species in the section Oxybaphoides in the United States and Mexico. Mirabilis laevis and its component taxa have a tortuous taxonomic history that has resulted in many names published at the specific and infraspecific levels (Rodríguez 1992), based on differing generic, specific, and infraspecific concepts in the group. Generic concepts emphasized primarily the importance of the number of flowers per involucre, the shape of the fruit, and the degree of accrescence of the involucre. Specific or varietal decisions have primarily emphasized fruit shape and surface patterns, color of perianth, and nature of pubescence of foliage and stems.

## MATERIALS AND METHODS

For this study more than 3000 herbarium specimens were examined from A, ARIZ, ASU, BRY, CAS, DS, GH, K, MO, NMC, NY, POM, RM, RSA, SD, UC, US, and UTC (abbreviations from Holmgren et al. 1990). From these specimens, 256 from the M. laevis complex were selected that had information about perianth color, possessed ripe fruits and at least midstem leaves, and had adequate data regarding place and date of collection. These specimens represent the morphological variation and geographic range of the taxa. They supplied data for morphological characteristics plotted in Figures 2 and 3 and described in treatments of taxa. Taxonomic decisions were made after study of specimens and the inspection of maps generated by plotting morphological characteristics geographically. Types or microfiches of types for basionyms were seen insofar as possible. From this information taxa were delineated that seemed to have some morphological, ecological and geographical reality. Those that showed considerable intergradation were recognized at the varietal level. The order of taxa in the treatment is based on perceived habitat specialization and reduction in number of fruits as generally compared to other Mirabilis.

We have separated detailed discussions of variation based on study of specimens in the Mirabilis laevis complex from the main taxonomic treatment and have included that in Appendix 1. Appendix 2 consists of standard citations of representative and/or cited specimens., including those that voucher chromosome counts.

Le Duc (1995) provides a key to the sections of Mirabilis.
TAXONOMY
Mirabilis sect. Oxybaphoides A. Gray in Torrey, Bot. Mex. Bound. 173. 1895. Allioniella Rydberg, Bull. Torrey Bot. Club 29:687.1902; Hesperonia Standley, Contr. U. S. Natl. Herb. 12:360. 1909. Type: Mirabilis oxybaphoides (A. Gray) A. Gray.

Herbaceous to suffrutescent or shrubby perennials; root (of North American taxa; others unknown) long, cylindrical, cordlike; stems erect to decumbent or prostrate, densely to sparsely leafy. Leaves more or less evenly distributed, basal leaves larger, petiolate, distal leaves smaller, short-petiolate or sessile, margins plane. Inflorescences axillary and terminal in open or congested, few- or repeat-edly-branched cymes; involucres bell-shaped, slightly accrescent, with 1 or 3 flowers inserted at base. Perianth broadly funnelform, abruptly flared from narrow tube, deeply 5-lobed; stamens 3-5. Fruit ellipsoid or obovoid, base not or slightly constricted, apex rounded, truncate, or somewhat nipple-like, surface with 0 or 5-10 indefinite or prominent lines, often somewhat furrowed, smooth or very slightly rugose, usually glabrous, mucilaginous when wetted.

A poorly understood section of about 10-20 species, North America, South America, southern Asia. Heimerl (1934) suggested there were about 23 species in the section, but considerable redefinition and consolidation of taxa in North America has reduced that number. Diversity is greatest in South America (Heimerl 1934).

KEY TO NORTH AMERICAN MIRABILIS, SECTION OXYBAPHOIDES

1. Involucres 3-flowered. $\qquad$ 1.M. oxybaphoides
2. Involucres 1 -flowered (very rarely 2 flowers).
3. Fruits $6-8 \mathrm{~mm}$ long; perianth white, $15-18 \mathrm{~mm}$ long above the constriction.
4. M. oligantha
5. Fruits $2.5-5.5 \mathrm{~mm}$ long; perianth white, pink, or magenta, $7-15 \mathrm{~mm}$ long above the constriction.
6. Involucre in flower 7-10 mm long, the lobes narrowly lanceolate, at the base $1 / 4-1 / 3$ as wide as long; perianth white or pale pink; leaf blades commonly $4-6 \mathrm{~cm}$ long, ascending.
7. M. tenuiloba
8. Involucre in flower $3-6 \mathrm{~mm}$ long, the lobes triangular to lanceolate, at the base $1 / 3$ to equally as wide as long; perianth white, pink, or magenta; leaf blades commonly $1-3.5 \mathrm{~cm}$ long, spreading or ascending.
9. M. laevis
10. Mirabilis oxybaphoides (A. Gray) A. Gray in Torr., U.S. \& Mex. Bound. Bot. 173. 1859. Quamoclidion oxybaphoides A. Gray, Amer. Jour. Sci. 2, 15:320. 1853. Allionia oxybaphoides (A. Gray) Kuntze, Rev. Gen. Pl. 22:533.1891. Allionella oxybaphoides (A. Gray) Rydb., Bull. Torrey Bot. Club 29:687. 1918. Type: at the foot of mountains east of El Paso, in the shade of high rocks, Wright 596 (Lectotype, here designated: GH!, right side of sheet). Gray mixed Wright's field numbers 1223 (mountains near El Paso, in shade, procumbent, Sep 12, 1849) and 1322 (at the foot and in the shade of high rocks, fl. purple, Oct 14,1849 , noted on sheet to be probably Hueco Tanks). At this time it cannot be determined from which site either of the two specimens on the sheet originated. The one on the right is the more mature and representative; a second specimen originally at the Boston Society of Natural History, transferred to GH! in 1941, very closely resembles the plant on the right of the type sheet, is in a similar stage of maturity, and is a probable isolectotype.
Oxybaphus wrightii Hemsl., Biol. Centr. Amer. 3:3. 1882. Type: NORTH MEXICO: Chiricahui Mountains, Wright (Holotype: K). Hemsley sites only general locality
and collector, without number or date. Gray (1853) cites Wright 1721 (GH!), from Guadalupe Pass in the "Chiricahui Mountains," the collection probably seen by Hemsley. If from the present day Guadalupe Pass, the collection originated in the Peloncillo Mountains in New Mexico.
Mirabilis oxybaphoides var. glabrata Heimerl, Annuaire Conserv. Jard. Bot. Genève 5:180. 1901. Allioniella oxybaphoides var. glabrata (Heimerl) Standl., Contr. U.S. Natl. Herb. 12-357. 1909. Type: NEW MEXICO. Lincoln Co.: El Capitan Mts., 31 Aug 1900, F.S. \& E.S. Earle 399 (holotype: US!; ISOTYPE: NMC!)

Plants usually loosely clump-forming, herbaceous basally, the stems of ten intertangled and clambering through other vegetation. Stems ascending, spreading or decumbent, 0.2-1.2 m long, repeatedly branched, green throughout, puberulent in lines or throughout, glandular or not, the pubescence denser distally. Leaves thin or slightly fleshy; petioles up to 3.5 cm long on basal leaves, becoming progressively shorter distally, the distal leaves subsessile or on petioles to 4 mm long; blades of the basal and midstem leaves broadly deltoid or ovate, $1.5-8.0 \mathrm{~cm}$ long, $1.0-7.5 \mathrm{~cm}$ wide, glabrous or puberulent, and then of ten glandular, the base cordate, the apex usually acuminate or acute, sometimes rounded; distal leaves from broadly deltoid to lanceolate, $5-15 \mathrm{~mm}$ long, 3-10 mm wide, the base cordate or rounded. Inflorescence loosely and narrowly cymose or narrowly thyrsoid. Involucres solitary or loosely clustered at the ends of branches, or solitary in forks of branches or axils of leaves, on slender peduncles up to 17 mm long, glandular-puberulent, widely bowl-shaped in fruit, much broader than deep, 5-9 mm long, the 5 bracts united by their margins $1 / 3-1 / 2$ their length, the lobes approximately equal, broadly triangular, 4-6 mm long, about as wide at the base, the apices acute. Perianth campanulate, purplish pink, pale pink, or occasionally white, sparsely viscid-puberulent externally, 5-9 mm long, about as wide, strongly constricted above the indurate base. Fruits 3 per involucre, olive or dark brown and black-mottled or evenly black, broadly obovoid to nearly spherical, ca. 2.5-3.5 mm long, the width ca. 70-90\% of the length, smooth or very slightly rugulose, sometimes faintly marked with 5 shallow grooves (Fig. 1). $2 n=30_{\text {II }}$ (Spellenberg \& Soreng 5858).

Distribution (Fig. 4).-Southern Nevada, southern Utah, and southern Colorado, south through Arizona, New Mexico, and western Texas to northern Chihuahua, western Coahuila, and western Nuevo León, in open woods, on banks in woodland, among brush or boulders, usually where somewhat moist, 15002600 m . Flowering (June-)August-October:

The species is readily recognized by the distinctive shape of the leaves. At the apex of the petiole the base of the blade is broadly cuneate within the sinus of the overall cordate base, the curve at each side of the base of the blade reversing in a sinuate manner before joining the petiole. The apex of the blade is usually acuminate. Very glandular-pubescent plants and glabrate plants may occur in the same population (Spellenberget al.9681). Plants may be sufficiently viscid to "catch little birds" (label data, Vestal \& Vestal 56). Leaf shape is consis-
tent throughout the range except in Nuevo León, where leaves on some plants are cordate-truncate at the base, rounded at the tip. On these plants the stems are little-branched and apparently ascending.

Plants were used by Native Americans to help heal "broken or bent" bones (label data, Vestal \& Vestal 408).
2. Mirabilis laevis (Benth.) Curran, Proc. Calif. Acad. Sci., ser. 2, 1:235. 1888.

Oxybaphus laevis Benth., Bot. Voy. Sulphur 44. 1844. Hesperonia laevis (Benth.) Standl., Contr. U.S. Natl. Herb. 12:363.1909. Quamoclidion laeve (Benth.) Rydb., Bull. Torrey Bot. Club 29:687. 1902. Type: BAJA CALIFORNIA: Magdalena Bay, 1841, Hinds s.n. (holotype: K!; photos of holotype NMC!).
Plants few-stemmed and clambering through other vegetation to many stemmed and forming clumps as wide or wider than tall; stems from the previous year of ten present and skeletal-white. Stems herbaceous or suffrutescent or clearly woody basally, $0.15-0.8 \mathrm{~m}$ long, erect or decumbent, repeatedly branched and appearing more or less dichotomous, glabrous, glabrate, puberulent, more or less scabrous, or viscid-villous, when pubescent, the pubescence denser distally, hairs spreading or retrorse; internodes $0.5-11.5 \mathrm{~cm}$ long. Leaves more or less fleshy, pubescent like the stem; petioles 1-22 mm on basal leaves, becoming progressively shorter distally, 0-4 mm long on distal leaves; blades of the basal and midstem leaves ovate, deltoid-ovate, ovate-rhombic, or subreniform, $1-4(-5.5) \mathrm{cm}$ long, $0.5-3.5(-5) \mathrm{cm}$ wide, the base cordate, truncate, or broadly obtuse, apex acute (occasionally attenuate), obtuse, or rounded, distal leaves lanceolate, lance-ovate, or ovate-rhombic, $5-17(-23) \mathrm{mm}$ long, 3-11(-26) mm wide, the base cordate, truncate, or rounded. Inflorescences cymose or, in western races, more or less thyrsoid by partial suppression of one of the pair of axes. Involucres clustered and nearly sessile at the ends of branches, or solitary in forks of branches or axils of leaves, on peduncles 3-12 mm long, campanulate, $3-7 \mathrm{~mm}$ long in flower, enlarging about $1.5 \times$ in fruit, the peduncles elongating slightly and deflexed; lobes of involucre $5,1 / 3$ as long to equalling the length of the tubular portion, slightly unequal, narrowly to broadly triangular or trian-gular-lanceolate, the base $1 / 3$ to equal to the height. Perianth widely flared from a narrow constriction atop the indurate base, white, white with magenta veins, pink, lavender, or magenta, sparingly puberulent externally, $10-16 \mathrm{~mm}$ long, in full anthesis usually slightly wider. Fruits 1 (rarely 2) per involucre, gray or dark brown to almost black, ovoid, obovoid, or almost spherical, 3-5.5 mm long, 3-4 mm wide, glabrous, almost smooth to moderately rugose, of ten faintly mottled with darker brown or black, with or without 10 paler, diffuse longitudinal lines, becoming mucilaginous when wetted (Fig. 1).

Distribution (Figs. 2, 3).-United States from central California and eastern Oregon southward through southwestern Utah and central Arizona, south to Mexico in west-central Sonora and west-central Baja California Sur.


Fig. 2. Distribution of Mirabilis laevis varieties in western United States. Varieties as recognized in this treatment are indicated by open or closed circles or squares, and characters of specimen from that site are indicated by symbols attached to circle or square (as indicated in legend in inset). Map simplified from Rodríguez (1992).

We recognize four intergrading varieties based on morphological differences that serve to help delineate more or less distinct geographic races. For the past century authors have wrestled with the variation presented by these plants, some taking a rather conservative view and placing most forms in an inclusive Mirabilis laevis, others splitting variants as species or infraspecific taxa. Even on one of the syntypes (NY) of Mirabilis californica, the first of the variants to


FIg. 3.Distribution of Mirabilis laevis varieties in western Mexico.Varieties as recognized in this treatment are indicated by open or closed circles, squares, or triangles, and characters of specimen from that site are indicated by symbols attached to circle or square (as indicated in legend in inset). Map simplified from Rodríguez (1992).
be split from M. laevis, the epithet "leavis Benth." appears on the collecting label along with "Oxybaphus glabrifolius Vahl." Curran (1888), in transferring Mirabilis laevis from Oxybaphus noted that plants recently brought from Magdalena Bay were "nearly but not quite glabrous, the inequality of the involucral lobes variable and of ten not greater than is found in our Californian
forms." Wiggins (1964) placed all forms in the complex south of about $27^{\circ} \mathrm{N}$ in Baja California Sur into M. laevis, apparently ignoring populations to the north except for Mirabilis californica var. cedrosensis, which he noted to occur from San Clemente Island, California, southward on the west side of Baja California to the Vizcaíno Desert area (ca. $27^{\circ} \mathrm{N}$ ). In that work Wiggins noted the inland specimens of M. laevis to be "quite viscid-puberulent to short-villous and of ten have the coarser and almost retrorse scabrous hairs on the upper stems that occur in forms of M. californica."

What was previously considered Mirabilis californica now comprises M. laevis var. crassifolia, which usually has an inflorescence with a more or less well defined central axis and shorter lateral branches, the entire shape being irregularly conical. We are terming this inflorescence form "thyrsoid." This contrasts to the much more openly and symmetrically forked inflorescences of many of the inland populations. We call these "cymose." The distinctions are not sharp.

## KEY THE VARIETIES OF MIRABILIS LAEVIS

1. Plants glabrous or with a few hairs in distal parts; lobes of involucre lanceolate,
width of base $1 / 2-2 / 3$ times the height of lobe; perianth probably magenta.___ 2a. M. laevis
var. laevis
2. Plants pubescent, rarely glabrate; lobes of involucre lanceolate to triangular, width
of base $1 / 2-1$ times height of lobe; perianth white, pink or magenta.
3. Perianth pink or magenta, rarely white; width of lobe of involucre at base often
$1 / 2-2 / 3$ times height of lobe; plants pubescent, the pubescence usually not
notably viscid nor retrorse (but hairs often stout and recurved along the coast);
inflorescence commonly narrow and more or less thyrsoid.
2b. M. laevis
4. Perianth white, rarely pale pink; width lobe of involucre at base $2 / 3-1$ times height of lobe; plants commonly notably viscid-pubescent or sparsely short-pubescent with retrorse hairs; inflorescences broad, cymose.
5. Plants viscid-pubescent, hairs spreading, ascending or sometimes retrorse.

2c. M. laevis var. villosa
3. Plants puberulent, hairs retrorse.

2d. M. laevis var. retrorsa

## 2a. Mirabilis laevis (Benth.) Curran var. laevis.

Stems glabrous. Leaves glabrous adaxially, with a few short straight hairs abaxially; blades of the basal and midstem leaves ovate or deltoid-ovate, 3-4 cm long, 2-3cm wide, apex acute; distal leaves lanceolate, lance-ovate, or rhom-bic-ovate, $7-14 \mathrm{~mm}$ long, $2-5 \mathrm{~mm}$ wide. Inflorescence narrowly thyrse-like, with a long main axis and shorter side branches bearing near their tips involucres borne singly or in small clusters. Involucres $7-10 \mathrm{~mm}$ long, sparsely short vis-cid-villous, the bracts united $1 / 3-1 / 2$ their length, the lobes lanceolate or ovatelanceolate, acute. Perianth magenta. Fruit almost spherical, 4.5 mm long, 4 mm wide (Fig. 1).

Distribution (Fig. 3).-Apparently restricted to the vicinity of Magdalena

Bay, Baja California Sur, Mexico; habitat not recorded, 0-50? m. Flowering late winter and spring.
2b. Mirabilis laevis var. crassifolia (Choisy) Spellenb., comb. nov. Oxybaphus glabrifolius Vahl var. crassifolius Choisy in DC., Prodr. 13(2):431.1849. Type: NOVA CALIFORNIA: 1833, Douglas s.n. (holotype: G-DC [microfiche RSA!]).
Mirabilis californica A. Gray ex Torr. in W. H. Emory, Rep. U.S. Mex. Bound. 2(1):169, 173, plate 48. 1859. Oxybaphus californicus (A. Gray) Hook. in Benth. \& Hook. f., Gen. Pl. 3:4.1880. Hesperonia californica (A. Gray) Standl., Contr. U.S. Natl. Herb. 12:364. 1909. Type: CALIFORNIA: San Diego, sand hills, 1850, C.C. Parry s.n. (LECTOTYPE, here designated: NY!). In proposing the name, Gray states that M. californica came from "dry hills, San Diego, California," and then indicates the collectors "Parry, Thurber." On a sheet from the Torrey Herbarium at NY are three specimens. One, at the top, collected in Los Angeles by Mr. Rich is of no further concern. At the bottom of the sheet are two portions of plants associated with a single label, indicating the plants were collected by C.C. Parry on "sand hills" in San Diego in 1850. Because the statement on the label most closely matches the habitat described, and the specimen at the lower right of the sheet clearly is the source of the illustration for plate 48 (mistyped as plate 46 in the original description), we are selecting the material at the bottom of the sheet as the lectotype. Syntypes: San Diego, Wood Valley, May 1852, Thu rber 569 ( 2 specimens, GH!); Bigelow, Whipple Expedition, on the Colorado, 1853-54 (GH!, NY!) [which represents the var. villosa (Kellogg) Spellenberg, as delimited herein]; Bigelow, 21 Mar 1954 (GH!). At the time of publication Gray questioned whether Oxybaphus laevis Benth. might be the same as his new species, noting that the species is "commonly more or less pubescent, and rarely glabrate." Torrey (U.S. Rep. Expl. Miss. Pacific 4:131. 1857) assigned Bigelow specimens incorrectly to Oxybaphus glabrifolius Vahl. Gray, in the protologue of M. californica, cites Torrey's listing, correcting the placement of these specimens. Gray later, in the protologue of $M$. bigelovii alludes to the Bigelow specimens and indicates that this new taxon occurs "perhaps in California on the Colorado."
Hesperonia californica subsp. microphylla Standl., Contr. U.S. Natl. Herb. 12:365. 1909. Type: MEXICO. LOWER CAlIFORNIA: San Martin Island [off the west coast of the state of Baja California], 12 Mar 1897, Brandegee s.n. (holotype: UC!). Paratype: LOWER CALIFORNIA: Ensenada, 26 Apr 1893, T.S. Brandegee s.n. (UC!).
Hesperonia cedrosensisStandl., Contr. U.S. Natl. Herb.12:362.1909. Mirabiliscedrosensis (Standl.) Jepson, Fl. Calif. 459.1914. M. californica var. cedrosensis (Standl.) Macbr., Contr. Gray Herb. 56:24. 1918. M. lae vis var. cedrosensis Standl.) Munz, Man. South. Calif. 151. 1935. Type: MEXICO. BAJA CAlIFORNIA: Cedros Island, 3 Apr 1897, T.S. Brandegee s.n. (holotype: UC!). Paratypes: CALIFORNIA: San Clemente Id., Oct. 1902, Trask 14 (US!). California: San Clemente Id., May 1903, Trask 193 (US!).
Hesperonia heimerlii Standl., Contr. U.S. Natl. Herb. 13:412. 1911. Mirabilis heimerlii (Standley) Macbride, Contr. Gray Herb. 56:24. 1918. Type: BAJA CALIFORNIA: Guadalupe Island, Send of island, 3 Mar 1889, E. Palmer 886 (HOLOTYPE: US!: ISOTYPE GH!).
Mirabilis laevis var. cordifolia Dunkle, Bull. S. Calif. Acad. Sci. 40:108.1941. Type: CALIFORNIA: San Clemente Island, Chinetti Canyon, 3 Apr 1939, Dunkle 7234 (holoTYPE: RSA \#350685!; ISOTYPE RSA \#464676!). Both specimens at RSA have been transferred from LAM; of the two the holotype has a hand written label with the word "type." Dunkle (1941) noted two variants in the same population, his new var. cordifolia intermixed with var. cedrosensis.

Stems of ten glabrous basally, viscid-pubescent or more or less scabrous distally. Leaves puberulent, viscid-villous, or more or less scabrous, sometimes becoming glabrate with age (or occasionally glabrous); blades of the basal and midstem leaves ovate-rhombic, subreniform, or deltoid-ovate, $1-4.5 \mathrm{~cm}$ long, $0.4-3.5 \mathrm{~cm}$ wide, the apex obtuse or acute, occasionally rounded; distal leaves lanceolate, lance-ovate, or ovate-rhombic, $5-14 \mathrm{~mm}$ long, 2-7 mm wide. Inflorescence of ten rather thyrse-like after the first few dichotomous branches, the branches short, the involucres in clusters along a main axis. Involucres 5-9 mm long, densely short viscid-villous or sometimes slightly scabrid, the bracts united $1 / 3-2 / 3$ their length, the lobes ovate or ovate-oblong, obtuse or acute. Perianth pink, lavender, magenta, occasionally white. Fruit ovoid, 3-5 mm long, 2.7-3.7 mm wide, dark to pale gray-brown and mottled with dark gray-brown, tan, or red-brown, sometimes faintly and irregularly pale-striped (Fig. 1).

Distribution (Figs. 2, 3).-West-central California south along the coast, on the Channel Islands, and in the Coast Ranges to the Viscaino Desert, Baja California Sur and the coastal islands, Mexico; coastal bluffs, road banks, coastal scrub, grasslands, chaparral, oak woodland, of ten on rocky outcrops, 0-1830 m. Flowering most of the year, most vigorously in spring.

A particularly difficult area with regard to variation is around the southern end of the Sierra Nevada in California, where three of the varieties are in contact. Howell 38179 , from the Lake Isabella region in Kern Co., illustrates very well the problematic classification of some specimens. It was first left unidentified in Mirabilis, then sometime later placed in an inclusive M. laevis; 9 years later was identified as M. retrorsa; 21 years later as M. bigelovii var. bigelovii, and shortly later placed in a variable var. crassifolia. The specimen combines the spreading leaves and (light) villous pubescence of var. bigelovii, the pointed leaves and rather long involucre lobes of var. crassifolia, and some retrorse hairs similar to var. retrorsa. Flower color was not given by the collector and is not evident from the specimen, but as judged from Spellenberg's collections from this area, flowers were probably white. Nearby, from the entrance to Kern River Canyon, comes Howell 38142, a late-season collection showing thyrsoid inflorescences of var. crassifolia, and fairly pointed leaves, but in other respects is the var. villosa; a similar, later collection (Howell 38675) from the same area notes "calyx rose." For plants from the lower reaches of the Kern River Canyon, Spellenberg's observations note flowers only pink to rose, yet if these plants were collected eastward they easily would be placed in more consistently white-flowered var. villosa. Twisselman 8391, from the same area, is more or less villous and has blunt leaves, in these respects similar to the var. villosa, but it has a more or less accrescent involucre with proportionately longer lobes, more reminiscent of var. crassifolia. Also seemingly intergradient to var. villosa is Bedell 74-5 and Twisselmann 198, both from the north end of the Temblor Range in western Kern Co.; they have
thick fleshy leaves that are blunt, short involucre lobes, but thyrsoid inflorescences; Twisselmann notes that flowers are "purple."

Mirabilis laevis var. crassifolia may also intergrade with M.oligantha in Baja California Sur (Moran 18723).

Much has been made of features of pubescence over the taxonomic history of this group. Even within var. crassifolia there is considerable variation. Near the coast, and particularly on the islands of northwestern Mexico, hairs are stout and conical, distinguishing Hesperonia cedrosensis and subsequent synonyms. This pubescence type is thoroughly intergradient to finer but still conical-based hairs common within the var. crassifolia. Fruit characteristics, such as those used to distinguish H . heimerlii, also an island population, seem to be completely inconsistent from population to population. Other specimen-based discussion focuses individually on characteristics that have been used to distinguish species in this complex and is found in Appendix 1.

The label on a specimen collected in Baja California (Moran 12832) notes the indigenous name and use "Yerba del Empacho.-bueno para el estomacho." The vernacular name is repeated on Moran 23821 from Baja California Sur.
2c. Mirabilis laevis var. villosa (Kellogg) Spellenb., comb. nov. Mirabiliscalifornica var. villosa Kellogg, Proc. Calif. Acad. Sci. 3:10. 1863. Type: CALIFORNIA. MONO Co.: Calif. Hwy. 18210 m from Nevada border, Devil's Gate, canyon of East Walker River, Spellenberg 12326, 12 Jun 1996 (NEOTYPE, here designated: NMC! ; ISONEOTYPES [!]: BYU, CAS, F, K, MEXU, MO, NY, RM, RSA, UC, US). Kellogg (1863) provides brief but clear description of a plant that matches the classic concept of Mirabilis bigelovii except that he notes his var. villosa to have a "pink perigonium" (rather than white). He notes the taxon to come "from the interior-Devil's Gate and Carson River..." but he cites no documenting specimens. We found no specimens that were seen by Kellogg, all perhaps having been destroyed in the 1906 San Francisco fire. During field work involving this complex Spellenberg could not find Mirabilis at the well known "Devil's Gate" along U.S. Hwy. 395 north of Bridgeport, Mono Co., Calif., nor were plants to be found along the upper portions of the West Walker River along this highway. In either place habitat seems incorrect. They do occur, however, at a lesser known "Devil's Gate" along the East Walker River (DeLorme Mapping 1990) northeast of Bridgeport, and this is presumed to be Kellogg's Devil's Gate. Plants from this site form the neotype series.
Mirabilis bigelovii A. Gray, Proc. Amer. Acad. 21:413, 1886. Hesperonia bigelovii (A. Gray) Standl. N. Amer. Fl. 21:235. 1918. Type: Grand Canyon, May 1885, A. Gray s.n. (ноLOTYPE: GH!). Gray cites his own collection in the protologue, indicating also that the type comes from "below Peach Spring" where the species is "common." The holotype has penned in Gray's hand on a printed label "Grand Canon" and "Mirabilis bigelovii n. sp." but does not mention Peach Spring. In the protologue Gray alludes to Bigelow specimens, as discussed herein in the nomenclatural section under Mirabilis californica.
Mirabilis aspera Greene, Erythea 4:67. 1896. Mirabilis californica subsp. aspera (Greene) Parish, Muhlenbergia 3:125. 1907. Hesperonia aspera (Greene) Standl., Contr. U.S. Natl. Herb. 12:362. 1909. M. californica var. aspera (Greene) Jepson, Fl. Calif. 458. 1914. M. laevis var. aspera (Greene) Jepson, Man. Fl. Pl. Calif. 340. 1923.
M. bigelovii var. aspera (Greene) Munz, Man. S. Calif. 151. 1935. Type: CALILFORNIA: Mojave Desert, 14 Jun 1895, Parish 3757 (holotype: ND-G, photocopy at NMC!; ISOTYPES: GH!, UC!.) Jepson (1914) indicates the type locality to be Hesperia, San Bernardino Co., California.
Mirabilis glutinosa A. Nelson, Proc. Biol. Soc. Wash. 17:92. 1905 [nomen illeg., later homonym of M. glutinosa Kuntze, Rev. Gen. 3(2):265, 1898, a Bolivian plant]. Hesperonia glutinosa Standl., Contr. U.S. Natl. Herb. 12:365. 1909. Mirabilis limosa A. Nelson, Bot. Gaz. 47:426. 1909 [a substitute name for the earlier illegitimate name]; Hesperonia limosa (A. Nelson) Standl., Muhlenbergia 5:104. 1909 [a superfluous name]. Mirabilis californica var. glutinosa Jepson, Fl. Calif., 1:458. 1914. M. laevis var. glutinosa (Jepson) Jepson, Man. Fl. Pl. Calif. 340.1923. M. laevis subsp. glutinosa (A. Nelson) E. Murray, Kalmia 13:32. 1983. (same combination in Kalmia 12:22, 1982, based on incorrect basionym). Type: NEVADA: Karshaw, Meadow Valley Wash, 27 May 1902, Goodding 967 (holotype: RM!; ISOTYPEs: DS!, MO!, NY!, POM!, UC!). The paratypes cited (NEVADA. WASHOE Co.: Pyramid Lake, 9 Jun 1903, G.H. True 758 [RMI]; UTAH: St. George, 13 May 1902, L.N. Goodding 778 [RM!]; duplicates at GH!, $\mathrm{MO}!$ ) are the var. retrorsa in the present treatment).
Hesperonia aspera subsp. villosa Standley, Contr. U.S. Natl. Herb. 12:363. 1909. Type: CALIFORNIA: Mohave Desert, Cushenberry Springs, 2 Jun 1901, S. B. Parish 4940 (holotype: US!; ISOTYPE: NY!). Paratypes: CALIFORNIA: Providence Mts., 26 May 1902, T.S. Brandegee s.n. (UC!). CALIFORNIA: Argus Mts., Shepherd Canyon, 30 Apr 1891, Coville \& Funston 741 (NY!, US!).
Hesperonia glutinosa subsp. gracilis Standl., Contr. U.S. Natl. Herb. 12:365. 1909. H. limosa subsp. gracilis (Standl.) Standl., Muhlenbergia 5:104.1909. Type: ARIZONA, Sabino Canyon, 1892,J.S. Toumey 471c (holotype: US!). PARATYPES: ARIZONA: without locality, 1876, Palmer 644 (US!). ARIZONA: Tempe, 6 Apr 1896, J.S. Toumey s.n. (UC! - 2 sheets). CALIFORNIA: Colton, Feb 1881, G.R. Vasey s.n. (US! - 3 sheets, 2 apparently seen by Standley, 1 possibly not). NEW MEXICO: without locality, G.R. Vasey s.n., 1881 (US!) [as Standley notes in the discussion of this paratype, the location is probably incorrect; Standley knew of no collections from New Mexico, and none have been seen in the present study. Ewan and Ewan (1981) indicate that Vasey was in central and northern New Mexico, well away from nearest known populations in Arizona, and that specimens were apparently sent back to Washington unlabelled, increasing the possibility of error. To Spellenberg, the New Mexico paratype appears very similar to Vasey paratypes from Colton, California, particularly US \#22631].
Stems moderately to densely villous or viscid-villous, of ten with wavy hairs, or puberulent with $\pm$ retrorse hairs, the pubescence denser and increasingly viscid distally. Leaves $\pm$ fleshy, viscid-villous; blades of the basal and midstem leaves reniform-ovate, broadly deltoid-ovate, or suborbicular, $0.5-4 \mathrm{~cm}$ long, $1-3.7 \mathrm{~mm}$ wide. Inflorescence usually cymose, the branches $\pm$ equal throughout; involucres $5-7 \mathrm{~mm}$ long, the bracts united ca. $2 / 3$ their length, the lobes ovate-triangular or ovate-oblong, obtuse or acute. Perianth white or pale pink, occasionally (especially in far western part of range) deep pink or purple. Fruit ellipsoid to obovoid or almost spherical, 4-6 mm long, 2.5-4 mm wide, gray-brown, dark charcoalbrown, or olive, of ten dark-mottled, of ten faintly marked with 10 paler longitudinal lines (Fig. 3). $2 n=30_{\text {II }}$ (Spellenberg 5444)

Distribution (Figs. 2, 3).-Southeastern Oregon through Nevada, southwestern Utah, southern California (primarily southeastern, but extending west as far as eastern San Luis Obispo Co.), western Arizona to Baja California and northwestern Sonora; roadbanks, slopes, open desert, of ten among brush or in open woodland, 35-2200 m. Flowering most of the year, most vigorously in spring.

In California the var. villosa (as M. bigelovii), has been considered to be from east of the Sierra Nevada and the Transverse Range. Nevertheless, around the San Joaquin Valley some plants of the var. crassifolia approach the var. villosa (e.g., Ewan 10309; Hoover 3170; Raven et al9240, Twisselmann 8377) or cannot be excluded from it as here defined (e.g., Bacigalupi et al. 5205; Eastwood \& Howell 5839; Ferris \& Bacigalupi 10350; Keck 2158).

A vernacular name in Baja California recorded for this species is "Yerba de la Vieja" (Moran 23774).

From the type locality to the north plants are sporadic along the East Walker River and along the West Walker River where it exits from the Sierra Nevada and piñon pine vegetation into the Great Basin and its shrub association (Spellenberg 12331, 12332). Other plants in the region have much shorter, sparser pubescence and are more readily referable to the var. retrorsa (Spellenberg 12327,12329, 12333). No obvious habitat differences were detected between the two pubescence phases. Collection 12333 had flowers closed in midmorning that were very slightly pinkish. Otherwise, all plants seen in flower had white perianths.

In discussing M. aspera on the Colorado and Mojave deserts, Parish (1907) notes intergradation along edges of range with M. californica, and places the former into the latter as a subspecies. Intergradation is particularly evident in perianth color - those plants from the zone of contact having pink (rather than red-purple or white) perianths. To the west, in the var. crassifolia, perianth color is usually red-violet, but white-flowered plants are known. To the east the var. villosa usually has a white perianth, occasionally with a pale pink tube, or rarely entirely pale pink. The pattern probably results from selection pressure of primarily diurnal pollinators in the west and nocturnal pollinators in the drier deserts to the east (Baker [1961] discusses various pollinators in Mirabilisfroebelii (Behr) Greene, a species with red-violet flowers).

The pivotal nature of the var. villosa in the Mirabilis leavis complex is indicated by its extensive synonymy. As indicated by the discussion of variation as seen in various specimens (Appendix 1), the variety is variable and of ten intergrades with var. crassifolia and the var. retrorsa. In southeastern California and Baja California it is sometimes distinguished with difficulty from M.tenuiloba.
2d. Mirabilis laevis var. retrorsa (Heller) Jepson, Man. Fl. Pl. Calif. 340. 1923. M. retrorsa Heller, Muhlenbergia 2:193. 1906. Hesperonia glutinosa subsp. retrorsa (Heller) Standl., Contr. U.S. Natl. Herb. 12:365.1909. H. limosa subsp. retrorsa (Heller) Standl., Muhlenbergia 5:104. 1909. Mirabilis californica var. retrorsa (Heller)

Jepson, Fl. Calif. 458. 1914; Hesperonia retrorsa (Heller) Standl., N. A. Fl. 21:236. 1918. M. bigelovii var. retrorsa (Heller) Munz, Man. S. Calif. 151. 1935. Type: CALIFORNIA. MONO CO.. near the Southern Belle Mine, 25 May 1906, Heller 8336 (ноLOTYPE: BKL on indefinite loan to NY!; ISOTYPES: DS!, GH!, NY!, MO!, US!).
Stems glabrous or with a few retrorse hairs below, sparsely to densely retrorsepuberulent distally, when densely pubescent, then of ten also $\pm$ viscid. Leaves $\pm$ fleshy, puberulent with retrorse hairs; blades of the basal and midstem leaves reniform-ovate, broadly deltoid ovate, or suborbicular, occasional orbicularreniform, $0.5-3.5 \mathrm{~cm}$ long, $1-3.4 \mathrm{~cm}$ wide. Inflorescence usually cymose, the branches $\pm$ equal throughout; involucres $5-7 \mathrm{~mm}$ long, the bracts united ca. $2 / 3$ their length, the lobes ovate-triangular or ovate-oblong, obtuse or acute. Perianth white or occasionally white tinged with pink at the base, rarely entirely pale pink. Fruit ellipsoid to obovoid or $\pm$ spherical, $3.5-5 \mathrm{~mm}$ long, $2.6-4 \mathrm{~mm}$ wide, occasionally slightly wider than long, gray-brown, dark charcoal-brown, or olive, occasionally dark-mottled, of ten faintly marked with 10 paler longitudinal lines (Fig. 1). 2n=31-33 II (Strother 1256).

Distribution (Figs. 2, 3).-Southeastern Oregon, western and southern Nevada, southwestern Utah, northwestern Arizona, southern California, and northern Baja California; arid open areas among desert brush or in open woodland, often on banks, 60-2000 m. Flowering in spring, occasionally in winter, less frequently at other times.

In general, plants of the var. retrorsa are smaller, with smaller leaves, and apparently are more compact, providing more of a forking, repeating "wishbone" aspect (Bagley 2098, Clemon and Jonsson 1690, Clokey E Templeton 5725, Munz 16449), than most of those of var. villosa. Nevertheless, open sprawling plants with stems 3.5-4 dm long, with leaves $2+\mathrm{cm}$ long, and inflorescences $\pm$ thryse-like (Peirson 7180), resemble in aspect either the var. crassifolia or the var. villosa. Local environmental factors may also affect the phenotype; e.g., Munz E Keck 4754 is a lanky plant with broad thin leaves. It is said to come from "among rocks along canyon" and may be a shade form. Plants indistinguishable from the tighter, smaller, northern forms of this variety occur as far south as the mountains of southern California (Peirson 9846) and Baja California (Moran 14842).

The variety retrorsa may co-occur with the var. villosa (see two specimens at DUD, Train s.n., 30 Apr 1937, both from Darwin Falls Canyon; also Duran 3455 [retrorsa] and Mooney et al. 132 [villosa], both from Silver Canyon in the White Mountains). Munz noted his collections 13036 (var. retrorsa) to be not glutinous, 13037 (var. villosa) from the same site to be glutinous. The Duran 3455 specimen cited immediately above has long internodes and spreading rounded leaves more typical of var. villosa, but has very short, mostly retrorse hairs; in respect to habit and pubescence it is intermediate between the two varieties. Mixed collections of the two are represented by M. \& E. Epling s.n. and

Maguire \& Holmgren 25193. The two also occur in close vicinity on the east side of the Sierra Juárez in northern Baja California (Thorne, Boyd, et al. 61758 = var. retrorsa; Thorne et al. $57784=$ var. villosa).

As discussed for the var. crassifolia, Kern Co., California, is also an area of particular difficulty concerning the var. retrorsa. Numerous collections suggest intergradation with the var. villosa; e.g., very dense pubescence, clearly retrorse, is present in Eastwood 3200; on Hall and Chandler 6882, a similar plant from the same general region, the collectors note that the flowers are pure white and the plants are viscid. Further indicating the difficulty of satisfactorily classifying material from this area, two specimens collected very near one another a week apart in the same year each represent a different variety; Voegelin 67 is nearest the var. crassifolia, whereas Cole and Voegelin 120 is clearly var. retrorsa. Another pair of specimens from the same vicinity, in Red Rock Canyon (vicinity of Red Rock Canyon State Park) are the var. retrorsa (Abrams 11877) and a fairly lightly pubescent phase of the var. villosa (Munz 1246). Howell 37115, in its fairly dense but downward-flexed pubescence, approaches the var. villosa, and in its pointed leaves the var. crassifolia (flowers on the specimen appear to have been white). In this region of contact between the three varieties, $\pm$ typical plants of the var. retrorsa occur (Howell 38667).
3. Mirabilis tenuiloba S. Watson, Proc. Amer. Acad. Arts 17:375. 1882. Hesperonia tenuiloba (S. Wats.) Standley, Contr. U.S. Natl Herb. 12:363. 1909. Type: SOUTHERN CALIFORNIA: San Bernardino, 1880, W.G. Wright 106 (holotype: GH!; photo and fragment of holotype at DS!). According to note on labels of Parish 6072, the type locality is in West Canyon, western edge of the Colorado Desert, Riverside Co.

Plants forming leafy clumps $0.3-1 \mathrm{~m}$ or more in diameter, usually with many stems, herbaceous or somewhat suffrutescent basally. Stems ascending 0.2-1 m long, with few to many ascending branches, pale green or white at base, green distally, puberulent in lines or throughout, usually glandular-viscid, the pubescence denser distally. Leaves slightly fleshy; petioles to $2.2(-5) \mathrm{cm}$ long on basal leaves, becoming progressively shorter distally, the distal leaves sessile or on petioles to 4 mm long and gradually intergrading to the bracts of the inflorescence; blades of basal and midstem leaves broadly deltoid or ovate, the largest of ten wider than long, $2-5(-8) \mathrm{cm}$ long, $1.7-7.0(-12) \mathrm{cm}$ wide, glabrate to glandular villous, the base rounded to cordate, the apex usually acute, sometimes rounded; distal leaves from broadly deltoid to lanceolate, of ten acuminate, $1-2 \mathrm{~cm}$ long, $7-15 \mathrm{~mm}$ wide, the base cordate or rounded. Inflorescence usually narrowly thyrsoid. Involucres densely clustered among distal leaves or bracts near ends of branches, on peduncles 0-2 mm long, glandular-pubescent, narrowly campanulate, deeper than broad, $7-16 \mathrm{~mm}$ long, the 5 bracts united by margins $1 / 3-1 / 2$ their length, the lobes approximately equal, narrowly lanceoblong, $1 / 5-1 / 4$ as wide at the base, the apices acute or attenuate. Perianth cam-
panulate, white (rarely pink), sparsely viscid-puberulent externally, $13-18 \mathrm{~mm}$ long, about as wide, strongly constricted above the indurate base. Fruits 1 per involucre, dull reddish brown to almost black, rarely with 10 inconspicuous and very slightly paler lines, broadly ovoid to nearly spherical, 4-6 mm long, the width 60-85\% of the length, smooth or very slightly rugulose, sometimes faintly marked with very shallow grooves (Fig. 1).

Distribution (Fig. 4).-Southern California, southwestern Arizona, and northwestern Sonora, south to Baja California Sur, on slopes, canyon sides, cliffs, and among rocks, or in gravel or sand in semi-arid and arid areas, 0-400(-900) m . Flowering late winter and spring, occasionally other times.

The species is from east of the mountains in southern California and from near the gulf in Baja California and therefore is mostly a desert species. It is known in Arizona only from the Tinajas Altas Mountains in Yuma Co., where it was collected in 1940 by L. Goodding (s.n., 7 Mar 1940), the collection remaining unidentified for more than 50 years. It was rediscovered (Felger \& Broyles 92613) and reported from there by Felger (1993). As noted by Felger, the species was sympatric with M. bigelovii ( $=$ M. laevis var. villosa) (Felger E Broyles 92614). A. and R. Nelson apparently collected M. laevis var. retrorsa (3236, but as M. limosa) in sympatry with M. tenuiloba (3236a), perhaps separating the collections later under the "a" number. The Nelson collection of M.tenuiloba $3236 a$ has leaf tips more rounded than usual for the species, plants are less robust, and involucres in the shorter portion of the range for the species. It may be an introgressed plant. Gander 1301, a robust, more "typical" M. tenuiloba, among a number of other collections, is from the same canyon. Sympatry involving such similar perennial species provides the opportunity for hybridization. Occasional collections such as Moran 8877 have involucres with triangular teeth 3-4 mm long, shorter than the tube, also suggesting intergradation with M. laevis.

MacBride (1918) considered Chandler 5332, from near Escondido in southern California, to be included in his concept of M. tenuiloba var. polyphylla, the only record north of Mexico for this entity. That specimen is here considered to be an extreme form of M. laevis var. crassifolia. Other somewhat similar specimens, having at maturity rather large involucres for M. laevis var. crassifolia, are from the Channel Islands (see Blakley 5238, Clokey 4923, Raven 17655).

The southernmost collection in Baja California Sur (Wiggins et al. 258) is much less pubescent that is characteristic of M. tenuiloba. The specimen was originally identified as M. oligantha.
4. Mirabilis oligantha (Standley) J.F. Macbride, Contr. Gray Herb. 56:23. 1918. Hesperonia oligantha Standley, Contr. U.S. Natl. Herb. 12:363. 1909. Type: BAJA CALIFORNIA: Calmalli, Jan-Mar 1898, Purpus 82 (holotype: UC!).
Hesperonia polyphylla Standley, Contr. U.S. Natl. Herb. 12:363-364. 1909. Mirabilis polyphylla (Standley) Standley, Publ. Field. Mus. Nat. Hist, Bot. Ser. 8:306. 1931. M. tenuiloba var. polyphylla (Standley) J.F. Macbride, Contr. Gray Herb. 56:23. 1918.


FIG. 4. Distribution of Mirabilis oligantha, M. oxybaphoides, and M. tenuiloba in North America.
Type: BAJA CALIFORNIA: San Borga, 6 May 1889, T.S. Brandegee s.n. (holotype: UC!). PARATYPE: LOWER CALIFORNIA: Gulf of California, Los Angeles Bay, 1887, Palmer 600 (UC! on same sheet as holotype; duplicate of paratype at GH!, with month given as Dec).
Plants usually dense shrubs or subshrubs. Stems erect, ascending or spreading, 0.3-1.2 m long, repeatedly branched, with a whitish or gray exfoliating bark on older stems, glandular-puberulent, densely so distally, becoming glabrate with age. Leaves slightly fleshy; petioles $1-20 \mathrm{~mm}$ long, about $1 / 5-1 / 3$ the length of the blade, becoming progressively shorter distally; blades of the midstem leaves broadly deltoid-ovate or ovate, about $2-5 \mathrm{~cm}$ long, $1.5-3 \mathrm{~cm}$ wide, sparsely to densely glandular puberulent, the base subcordate, rounded, or broadly cuneate, the apex acute, obtuse, or sometimes rounded; distal leaves progressively reduced from midstem leaves, from ovate to lanceolate, those among the flowers as small as 5 mm long, 2 mm wide, with a petiole of 1 mm long, the base rounded to cuneate. Inflorescence when well developed widely branching, the main axis
zig-zag, or sometimes comparatively dense and thyrsoid. Involucres or solitary in forks of branches or axils of leaves, on slender peduncles $4-15 \mathrm{~mm}$ long that are deflexed after anthesis, glandular-puberulent, narrowly urn-shaped in flower, distended by the globose fruit, $7-10 \mathrm{~mm}$ long, the 5 bracts united by margins aboutl/2 their length, the lobes narrowly triangular or lanceolate, 4-5 mm long, $1 / 3-1 / 2$ as wide at the base, the apices acute. Perianth campanulate, usually white, less of ten pinkish or lavender, sparsely puberulent externally, especially on the tube, $12-20 \mathrm{~mm}$ long, about as wide, strongly constricted above the indurate base. Fruits 1 per involucre, dark brown or nearly black, sometimes with 5 faint paler lines, ellipsoid, 6-8 mm long, smooth or slightly rugulose, sometimes faintly marked with 5 shallow grooves (Fig. 1).

Distribution (Fig. 4).-Central Baja California and northern Baja California Sur, on dry rocky slopes among desert shrubs and cacti, 50-600 m. Flowering fall to early spring, sometimes later.

Mirabilisoligantha is an endemic to the Baja California peninsula. A puzzling series of collections, mostly identified originally as M. bigelovii, come from the mountains of northern Baja California Sur, particularly from the vicinity of Picachos de Santa Clara, where M. oligantha has been collected (Gentry 7717). These plants may not have been so shrubby and stems may have been sprawling. They have rather sparse foliage, the progressively reduced leaves in the inflorescence characteristic of several M. oligantha specimens, and flowers borne singly or in few-flowered clusters. Involucres are small for M. oligantha, but have long lobes. Flower color noted on labels is white, pink, or lavender. Mirabilis laevis var. crassifolia occurs in the region, and the plants may represent intergradient forms. Such specimens have been annotated as that variety, with the note that they may be intergradient (Gentry 7697, Moran 18723, Moran $\mathcal{E}$ Reveal 19671, 19689).

Standley (1909) distinguished Hesperonia oligantha from other species in his key in part by stating that flowers are "purplish red." He also noted that stamens are "long exserted" in M. oligantha. Though the stamens are exserted somewhat in the species, as judged from herbarium specimens, the "long exserted" impression comes from Standley mistaking flowers as Hesperonia that actually are from some gamopetalous family, not Nyctaginaceae, attached as fragments to the holotype sheet. These flowers appear to have been dark in color. In 1911 and 1918 Standley did not mention flower color. Wiggins (1964) explicitly noted that M.tenuiloba has a white perianth and scarcely exserted stamens, and that M.oligantha (including M. polyphylla) has a white (or pink?) perianth, but for that species there is no mention of stamens. Of the 15 collections of $M$. oligantha seen, labels of five report the perianth as white or creamy white. One reports "white, slightly pinkish" (Moran 23808) and another "pale lavender" (Gentry \& Fox 11731)

## APPENDIX 1

# Specimen-based discussion on characteristics that have been used to distinguish taxa in the Mirabilis laevis complex. Plants vary in many features, and often a collection used to illustrate one point also illustrates others. Specimen citations comprise Appendix 2. 

## Mirabilis laevis var. crassifolia

Pubescence of var. crassifolia.-The var. crassifolia is variable with regard to pubescence within populations (Werff 4221 notes "plants conspicuously glandular, others not"), and intergrades with the vars. retrorsa and villosa to the east. The var. crassifolia usually has hairs that are noticeably broader at the base, somewhat or considerably coarser than the finer pubescence of the var. villosa or the short retrorse hairs of the var. retrorsa. Intergrades to the more villous var. villosa occur through much of range and are maintained in var. crassifolia primarily because of their relatively acute lower leaves, often comparatively long involucre lobes, and more or less thyrsoid inflorescences (Daniel 1345; Gentry 8886; Templeton 11388; Thorne \& Tilforth 41536). Such plants are particularly common in the southern California mountains and in Baja California. Others, particularly from interior Baja California, have blunter leaves and slightly finer pubescence than coastal plants, and in this respect begin to approach the var. villosa (Burgess 6095; Carter, Alexander \& Kellogg 2522; Moran 18694). These are retained in the var. crassifolia because of generally thyrsoid inflorescences and magenta or pink flowers. In California, specimen from near the coast in Ventura Co. has most of the characteristics of the var. villosa, i.e., long internodes, rounded leaves, villous pubescence, but has proportionately longer involucre lobes as in the var. crassifolia and flowers that are magenta to lavender (Thompsom 1857); plants to the north in Santa Barbara Co., are also similar (Pollard s.n., 30 Sep 1956). Others from this region have more acute leaves and proportionately narrower and longer involucre lobes as in the var. crassifolia (Bourell et al. 2938), contrasting with other plants in the region such as Hoover 7644, which has rounded lower leaves and proportionately short involucre lobes, but which has strongly tapering hairs more consistent with var. crassifolia. Extremely lightly pubescent plants that have pointed leaves and rather long involucre lobes occur on western edge of the California desert (Dunkle 3411).

Standley (1909) established Hesperonia cedrosensis in large part on the conspicuous, conical, recurved hairs, the extreme in this feature resulting in $\pm$ hispidulous plants as occur on Cedros Island (Henrickson 14453). Plants with such hairs are almost entirely coastal but not necessarily insular (Standley 1918). Plants of the Viscaino region in central Baja California may have pubescence similar to the stout recurved trichomes of plants from Cedros Island (Boyd, Ross \& Appleby 8100; Gentry 7391), as do plants along the northern Pacific coast of Baja California, which have notably pointed leaves (Chisaki \& Newcomb 525; Epling \& Robinson s.n., 15 Feb 1935). Specimens that have stout recurved hairs interspersed with finer hairs occur on the Channel Islands (Brandegee s.n., 25 Aug 1894; Munz 6645) and in the southern part of the range (Wallace 176). Others from the same islands show fewer recurved hairs and have somewhat more glandular puberulence (Moran 6848) or are barely recurvedpubescent at all but are more (Eastwood 6387) or less (Breedlove 2874) viscid-villous. The latter has rounded lower leaves reminiscent of the var. villosa, as do many plants on the Channel Islands, where larger, but not especially recurved, hairs may be mixed with a fine glandular hairs (Raven 17307). A very villous plant from these islands, thus similar to var. villosa, has long involucre lobes characteristic of var. crassifolia (Thorne 37483). Plants with large conical downward-curved hairs may occur inland to the north, as in Fresno Co. (Boolootian s.n., 6 Apr 1951).

Plants of var. crassifolia are not completely distinct from the var. retrorsa. Howell 39241, from Monterrey Co., is an open sprawling plant with pointed leaves as expected in the var. crassifolia, but has short calyx lobes and sparse retrorse hairs more similar to those of the var. retrorsa. Other collections, but from southern California, also well away from the main range of the var: retrorsa are lightly pubescent and have some retrorse hairs on stem, but have long involucre lobes more characteristic of
the var. crassifolia (Epling E Ellison s.n., 28 Mar 1930). Plants on the west slope of the southern Sierra Nevada approach var. villosa in their more or less villous pubescence, the hairs of which may be somewhat deflexed, and in their blunt leaves (Benson 3214, Hoover 3170); similar combinations of characteristics are found at the southern end of this mountain range where the geographic ranges of the three varieties come into contact (Jepson 6752, Thorne 31702). Along the contact zone of the var: retrorsa with the var. crassifolia in southern California are plants with retrorse hairs and white flowers, but with pointed leaves and rather long involucre lobes and conical hairs (Kamb 902).

A sparsely pubescent, lanky, very thin-leaved plant (Munz et al. 2672) appears to be an environmentally modified phase, having been collected on a "damp hillside."

Flower color of var. crassifolia.-Usually var. crassifolia has a deep rose or magenta perianth, intergrading through pink along the eastern edge of its range with the mostly white-flowered var. villosa (see discussion there). Nevertheless, and contrary to the key for Hesperonia by Standley (1909), within the range of var. crassifolia, sporadic variants with pale or white flowers are fairly frequent. "Flowers vary from purple to white" in populations in the northern part of range (Merced Co., Lyon 932) or "pale white with rose tint along veins" (San Benito Co., Ewan 10309, a plant very closely approaching var. villosa). Toward the southern end of the range plants with white (Gentry 8694; Moran \& Reveal 19671; Orcutt 219a; Reeder \& Reeder 7259), almost white (Gray s.n.), white tinged with pink (Moran \& Reveal 20006), pure white veined red (Trasks.n.), white to light lavender (Henrickson 8940), or pale lavender (Moran \& Reveal 19870) flowers occur, sometimes in mixed populations (Ewan 7041 - white, 7042 - pink; Moran 20414 = pink, 20415 = white). Pale-flowered, white-flowered, or mixed, populations in this region and along the eastern edge of the range are probably a response to selection pressures from nocturnal pollinators in the desert (e.g.,Jepson 6073, 8859). Whitish-flowered plants also occur in the coastal scrub of Baja California (Hodgson \& Pinkava 3011); white, pink and "red" flowers occur in the same population near the coast in southern California (Hastings s.n.,16 Apr 1941), and plants may occasionally have flowers white with red veins (Trask 193). Trask 14, however, from the same general locality, has magenta flowers. The last two specimens are paratypes of H.cedrosensis.
Leaf shape of var. crassifolia.-In an attempt to distinguish species in the complex, authors have reiterated features emphasized by Standley (1918), where leaves of the var. crassifolia (as Hesperonia californica) are said to be "... obtuse or acutish,... most of them narrowed to the apex and never rounded." (Standley 1918). Leaves are illustrated with rather round apices in Torrey's (1859) original plate (\#48), which we believe is based upon the lectotype selected by us. At the northernmost known locality in the Coast Ranges, in Alameda Co., plants are much less pubescent than is common in the variety, but in may have either rounded midstem leaves (Havlik 929) or rather pointed leaves (Spellenberg 12335); the later clearly has the thyrsoid inflorescence characteristic of this variety. Plants with long internodes, spreading $\pm$ rounded or bluntly acute leaves, lightly glandular-villous pubescence, and rather cymose inflorescences from the interior coast ranges in San Benito and Merced counties are very close to var. villosa; flower color is not indicated on specimens (Beylik 25; Hoover 4309; Spellenberg 12336).

Inflorescence of var. crassifolia.-In their extremes, the differences between the thyrsoid inflorescence of western races and the neatly forked inflorescence of some eastern populations from the desert are notable. From the western edge of the Colorado Desert, where collectors mostly note rose perianths (rarely white - Munz \& Everett 16245), plants are open, sprawling, and leafy, the inflorescences thyrse-like as the var. crassifolia. Nearby, on the sandy desert plain are plants more typical of var. retrorsa, less leafy in appearance, with recurved hairs, shorter erect or spreading stems, and an inflorescence that is much less thyrse-like, though it is still not neatly forked (V. \& A. Grant 15979).

Fruits of var. crassifolia. - Various authors have indicated certain fruit shapes or surface pattern are distinctive for taxa, particularly at the varietal level. Munz \& Keck (1968) indicate considerable variation in the fruit of a broadly delineated M. laevis (= var. crassifolia in sense of this paper), indicating
the fruits to be "dark, sometimes mottled or pale-striate, smooth," but provide specific and limited characteristics for the fruit of infraspecific taxa of M. bigelovii. Standley (1918) also maintains limited variation for the fruits in his taxa within Hesperonia. In the var. crassifolia fruits may be obovoid, broadly ellipsoid, or $\pm$ globose, grayish brown, and very faintly dark-mottled (Eastwood \& Howell 2396, Philbrick B68-80, Solbrig 2670); irregularly and faintly pale-striped and indefinitely darkmottled (Rose 63030); pale gray-tan, mottled faintly with $\tan$ (Wiggins 2054); grayish brown mottled with red brown (Spellenberg 10208); dark charcoal brown, faintly mottled darker (Youngberg 7); dark brown, faintly mottled darker and very faintly striped, paler near the apex (Munz \& Harwood 3900); grayish brown and mottled faintly slightly darker, with faint pale stripes at each end (Havlik 929).

## Mirabilis laevis var. retrorsa

Pubescence of var. retrorsa.-Two collections from the Granite Mountains, eastern San Bernardino Co., Calif., indicate intergradation between var. retrorsa and var. villosa, and perhaps the low significance of pubescence characters in general. Both these plants are similar in general aspect, being small and well branched; Stein 12 is glabrate, with a few downward-oriented hairs on the stems (a "good" var. retrorsa), whereas Tilforth \& Tilforth 1012 is villous. From the area of contact in southern California intermediate plants occur; Gould 2248, from the east base of the Coast Ranges in San Diego Co., has glandular villosity, some hairs downward directed, and white flowers as in var: villosa, but hairs with conical bases and thyrsoid inflorescences similar to var. crassifolia.

Flowers of var. retrorsa.-Flowers are usually white, but there occasionally are other color forms; white limb and rose throat (Clemon \& Jonsson 1690); rose (Twisselman 7280); white and rose-pink at same site (Hall and Chandler 6882, 6884, respectively).

Inflorescence of var. retrorsa.-The very neatly forked branching characteristic of this variety is illustrated by Peirson 8900, Holmgren \& Holmgren 7697, and Twisselman 7280. Near the area of contact with var. crassifolia, plants may have thyrsoid inflorescences (Benson 3136, M. E. Jones s.n., 25 Apr 1906, Winblad s.n., 2 Feb 1937); the Jones specimen also has unusually long involucre lobes for the variety.

Fruits of var. retrorsa.-Fruit shape and surface pattern are variable; $\pm$ globose, gray brown, not lined (Reveal \& Reveal 50); $\pm$ globose, with 10 pale lines (Henrickson 18257, Henrickson \& Bekey 18288); $\pm$ globose, yellowish brown, faintly darker mottled, not lined (Ferris 7988); broadly obovoid, dark, with 10 thin, pale lines (Munz \& Keck 7862, Peirson 8900); broadly obovoid, smoky brown, not lined (Spellenberg et al. 3151); ellipsoid, dark brown and very faintly mottled, incompletely and faintly 10lined pale (Thorne 33848). One population has plants occasionally with 2 fruits per involucre (Spellenberg 12342).

Leaves of var. retrorsa.-Leaves are usually obtuse or rounded at the tip. In the zone of intergradation to the var. crassifolia in southern California, intermediate plants may have acute leaves (Henrickson 5557). A pair of specimens suggest a strong genetic component to leaf shape and size, nature of pubescence, and involucre characteristics. Progeny from a collection with white flowers, small, acute leaves, and the pubescence of var. retrorsa from the north end of the Coachella Valley (Munz and Everett 16245) has retained these features (flower color not given) when grown in the Rancho Santa Ana Botanic Garden in Claremont (Balls 19406). A very acute-leaved phase of open habit is represented by Henrickson 17348.

## Mirabilis laevis var. villosa

Involucre of var. villosa.-Ordinarily, the involucre lobes of the var. villosa are about $1 / 2-1 / 3$ the length of the tube. Plants in southwestern Arizona have unusually long involucre lobes, equal to, or even slightly longer than, the tube. These may have resulted from introgression with M. tenuiloba (Reeves \& Lehto L20124, Harrison 11). Some plants from the penninsula of Baja California have the dense viscid-villous pubesence of the var. villosa but more or less thyrsoid inflorescences characteristic of var. crassifolia, and involucre lobes about as long as the tube (e.g., Carter 5449, Thorne et al. 62452).

Flower color of var. villosa.-Flowers are usually white in this variety. All three varieties mix in the Sierra San Pedro Martir of Baja California, where pink-or purple-flowered villous plants occur (Daniel 1414, Moran 24540). Transition from pink to white is seen in specimens where the throat retains pink but the perianth limb is white (M. Baker 4544, Palmer 208). On the west side range of var. villosa a number of collections document color variation in flowers within populations or departure from the usually white perianths of more eastern plants; white or pink perianths (Holmgren \& Holmgren 6535), white to lavender (Munz \& Hitchoock 12046), deep lavender (Wilken \& Werner 7485), or pink (Cooper 2257 - a plant intermediate to var. crassifolia in its acute leaves). In southeastern California collections by Hall and Chandler note white (7023) and pink (7024) flowers to occur in the same vicinity. Pale pink, pink, lavender, or purple flower are also known from farther east (Graham 3222; Henrickson 14004, Lloyd 2866; Train 1377; Wiggins 9648). In Kern Co., California, characteristics of varieties are variously combined; Twisselmann 8377 and Keck 2158, both from western part of the county are of open habit, have fairly large fruits, rather blunt leaves, and very villous pubescence, similar to "good" var. villosa, but in its "magenta" flowers and thyrsoid inflorescence it is more similar to the var crassifolia. Eastward in the county, are plants with "rosy-purplish" perianths and lighter pubescence, with a few retrorse hairs, leaves spreading, large and blunt, overall with an aspect like var. villosa, but the lighter pubescence and spreading leaves characteristic also of var. retrorsa (Howell 37226).
Leaf shape of var. villosa.-Plants with acute leaf apices occur along or near line of contact with the var. crassifolia in southern California (Peirson 1853; Roos s.n., 26 Mar 1966; Thorne \& Tilforth 40843; Tilforth \& Dourley 340). Sonoran plants of ten have $\pm$ acute leaves (Spellenberg 5444; Van Devender \& Kearns s.n., 18 Feb 1977). More or less typical plants with rounded leaf apices occur as far west as the Transverse Ranges of California (Gustafson 1025).

Pubescence of var. villosa.-In the mountains of southern California plants of ten are more sparsely pubescent in basal parts but are notably villous in upper parts (Peirson 5356). Lightly pubescent specimens in southwestern Arizona (Peebles et al. 463) approach the var. retrorsa, as do plants from southeastern California with the open habit and large, broad leaves of var. villosa, but with very short pubescence, of ten sparse on lower parts (Robinson $\mathcal{E}$ Lindner c57).

Inflorescences of var. villosa.-The dichotomous inflorescence characteristic of the desert races of M. laevis from east of the Sierra Nevada and the southern California coastal ranges is nicely illustrated by Clokey and Anderson 6603. Thyrse-like inflorescences more characteristics of the var. crassifolia occur in var. villosa well away from the range of the former in eastern Mojave Desert (Charlton \& Pitzer 1834), or nearer to range of var crassifolia in the southern California coastal ranges (Holmgren \& Holmgren 7539) or in Baja California (Wiggins 20832)
Fruits of var. villosa.-Fruits in this variety vary from nearly globose to ellipsoid or obovoid, the surface mottled or striped. Example of variation are: fruits $\pm$ globose, grayish, with 10 very faint and indefinite pale lines (Lloyd 2636, Munz 12465, Spellenberg 10206, Turner 62-2); broadly obovoid, indefinitely pale-lined at base (Morefield 4800, Spellenberg 2982); $\pm$ globose, 10 faint, pale lines alternating with 10 diffuse darker lines (Parish 3183, Munz 10930); $\pm$ globose, very dark and dark-mottled without lines (J. \& L. Roos 4182); ellipsoid or obovoid, gray or brown and black-or dark-mottled (Boyd et al. 2112, Felger \& Valenzuela L. 86-180, Higgins 6378, Reeves \& Lehto L20124, Roos s.n, Spellenberg 10205); broadly obovoid, unlined, grayish brown (Jepson 5959) or faintly lined (Jepson 5957, same time and place).

## APPENDIX 2

Representative and/or cited specimens. Specimens are cited by taxon, and within taxa geographically by country, state, and county, then alphabetically by collector: Those specimens that provided fruit for illustration in Figure 1 are indicated by and asterisk (*) following herbarium citation.

## Mirabilis laevis var. crassifolia

MEXICO. BAJA CALIFORNIA: 21.9 mi E of El Rosario via Hwy. 1,13 Oct 1981,Burgess et al. 6095 (ARIZ, SD); 0.9 mi N of Rosario, 6 Feb 1953, Chisaki \& Newcomb 525 (ARIZ, GH, RM, SD, UC); San Matias Pass of Sierra San Pedro Martir, 20 May 1981, Daniel 1345 (ASU); Cedros Id., ca. 2 mi S of lighthouse on E side, 23 Feb 1977, Davidson 5488 (RSA); 5 mi N of San Quintin, 15 Feb 1935, Epling \& Robinson s.n. (ARIZ GH,NY,RM, UC);Mina Desengaña, ca.. 16 mi N of Punta Prieta, 30 Mar 1950, Gentry 8886 (ARIZ);Cedros Id., ca. 1 mi S of village at Cabo Norte, 19 Jan 1975, Henrickson 14453 (NMC); 1 km N of San Vicente, 6 Jan 1984, Hodgson \& Pinkava 3011 (ASU); South Todos Santos Id., 7 Apr 1948,Moran 2802 (UC); Sierra San Borja, Rancho Carrizo, 20 Mar 1966,Moran 12832 (SD);San Esteban Id.,NE peak, $2842^{\prime} \mathrm{N}, 112^{\circ}{ }^{\circ} 5^{\prime} \mathrm{W}$, 26 Apr 1966, Moran 13051 (SD);San Martin Island, 21 Apr 1970, Moran 17458 (RSA); 7 mi SE of Laguna Chapala, 18 Oct 1971, Moran 18694 (ARIZ, RSA, SD); Guadalupe Island, south end of island, 30 Mar 1889, Palmer 886 (US*); ca. 23 km NW of parador Cataviña [Santa Iñez], 15 Jun 1980, Reeder \& Reeder 7259 (SD); San Martin Island, 3 mi off cinder cone of San Quintin, 21 Feb 1986, Thorne 61594 (RSA); Guadalupe Island, NE Anchorage, 28-29 Mar 1988, Thorne 63015.BAJA CALIFORNIA SUR: NW end of Viscaino Peninsula on road from Bahia Tortugas to Punta Eugenia, 2 May 1993,Boyd, Ross \& Appleby 8100 (TEX); 26 km N of San Ignacio, 10 Jan 1948, Carter, Alexander \& Kellogg 2522 (ARIZ, UC); 8 mi N of San Juanico, 8 Mar 1939, Gentry 4314 (ARIZ, GH); E bajada of Sierra Calvario, 10-15 Mar 1947, Gentry 7391 (ARIZ, RSA, UC); Picachos de Santa Clara, 5-10 Nov 1974, Gentry 7697 (SD); 2-3 mi E of Punta Eugenia, 13 Mar 1949, Gentry 8694 (ARIZ); between Volcán Tres Virgenes and Cerro Azufre, 27 29́N, $11234^{\prime}$ W , 11 Apr 1973, Henrickson 8940 (SD); Rancho la Laguna, Sierra San Francisco, $2735^{\prime}$ N, 11302 'W , 23 Nov 1976, Moran 23821 (SD); 6 mi N of San Andrés, Arroyo Calvario, 10 Feb 1973, Moran \& Reveal 20006 (SD); Picachos de Santa Clara, 3 Feb 1973, Moran \& Reveal 19689 (SD), 19671 (ASU,POM;SD);Cerro Azufre, $2730^{\prime} \mathrm{N}, 11236^{\prime} \mathrm{W}, 20$ Oct 1971, Moran 18723 (SD;UC);Volcán las Tres Virgenes, $27^{\circ} 29^{\prime} \mathrm{N}, 112^{\circ} 36^{\prime} \mathrm{W}$, 11 Apr 1973, Moran 20414 (SD), 20415 (SD, UC); Arroyo Malarrimo 11 mi S of mouth, 6 Feb 1973, Moran \& Reveal 19870 (ASU, SD, UC). U.S.A.CALIFORNIA. Alameda Co.: Wfacing slope of Mission Peak, 16 Jun 1980, Havlik 929 (CAS); E side of Fremont on Mission Peak, 16 Jun 1996, Spellenberg 12335 (F, MO, NMC*, NY, RSA, UC, US). Fresno Co.: Owens Mtn., 6 Apr 1951, Boolootian s.n. (JEPS); Owens Mt., 6 mi SE of Friant Dam, 9 May 1953, Quibell 1890 (RSA). Kern Co.: Greenhorn Mts., Mt. Breckenridge, 3 Apr 1932, Benson 3214 (UC); Oildale - Woody Road, 17 Apr 1938, Hoover 3170 (DS, UC); entrance to Kern River Canyon, 7 Jul 1962, Howell 38142 (CAS); Wofford, 7 Jul 1962, Howell 38179 (CAS); Kern River Canyon, 21 Sep 1962, Howell 38675 (CAS);Caliente, 15 Apr 1916, Jepson 6752 (JEPS); 2.6 mi E of Caliente, 16 May 1963, Thorne 31702 (RSA); Temblor Range, Cedar Canyon, 1 Jun 1952, Twisselmann 198 (CAS); mouth of Kern Canyon, 11 Jun 1963, Twisselman 8391 (CAS, RSA); 2 mi NE of Weldon, 5 May 1933, Voegelin 67 (UC). Los Angeles Co.: San Clemente Island, 10 Jun 1962, Blakley 5238 (SD); San Clemente Is., 25 Aug 1894, Brandegee s.n. (UC); Santa Monica Mts., Las Flores Canyon, 28 Mar 1930, Epling \& Ellison s.n. (MO, RSA, UC); Los Angeles, 16 Apr 1904, Grant 791 (ARIZ, CAS, DS, RSA); Los Angeles, May 1885, Gray s.n. (GH); Pacific Palisades, Temescal Canyon, 16 Apr 1941 Hastings s.n. (NY); Santa Catalina Id., S of Wilson's Harbor, 2 Mar 1941, Moran 669 (RSA); San Clemente Id., 2 mi S of Eel Point, 18 Sep 1958, Moran 6848 (DS, RSA, UC) [same site, 9 Mar 1959, Moran 7170 (DS, RSA)]; San Clemente Id., E coast, 9 Apr 1923, Munz 6645 (POM, UC); E of Zuma Beach, 4 Apr 1959, Raven 13964 (RSA); San Clemente Id., S of Eel Point, 11 Apr 1962, Raven 17307 (RSA, SD); San Clemente Id., just N of Guds, 9 May 1962, Raven 17655 (RSA, SD); near isthmus on Santa Catalina Id., Templeton 11388,25 Feb 1968 (RSA); Santa Barbara Id., Cat Canyon, 28 Apr 1968, Thorne 37483 (RSA, SD); San Gabriel Mts., San Dimas Canyon, 9 Apr 1971, Thorne \& Tilforth 41536 (RSA); San Clemente Id., May 1903, Trask sn (A).Merced Co.: Mine Canyon near Little Panoche Valley, 6 Apr 1940, Hoover 4309 (DS); Mine Creek 1.5 mi N of junction of Merced, Fresno, San Benito cos., 11 Apr 1935, Lyon 932 (UC).
Monterrey Co.: 6 mi From King City, 10 May 1936, Eastwood \& Howell 2396 (CAS, NY, UC); Redwood Gulch, 20 May 1960, Hardham 5795 (RSA); 6 mi N of King City, San Lorenzo Creek, 7 May 1963, Howell 39241 (RSA); 6 mi NE King City, 7 May 1963, J. T. Howell 39241 (RSA); 6 mi NE of King City, 7 May 1963, Rose 63030 (CAS, DS, RSA). Riverside Co.: Whitewater Canyon about 3 mi from mouth, 8 Apr 1932,

Ewan 7041 (POM); San Gorgonio Pass, 25 May 1914, Jepson 6073 (JEPS); Whitewater Wash near Whitewater, 11 Apr 1948, Kamb 902 (JEPS); Dry Morongo Wash, 2 May 1952, Munz \& Everett 16245 (RSA). San Benito Co.: ca. 6 mi SE of Panoche School, 12 May 1958, Beylick 25 (RSA); Cherry Hill Sch. W of Llanada, 25 Apr 1937, Ewan 10309 (RSA); 17.6 mi from New Idria on road to Panoche, 6 May 1956, Raven et al. 9240 (RSA); Road 107, 14.5 km SE of junction with Little Panoche Rd, 27 km NW of New Idria, 17 Jun 1996, Spellenberg 12336 (NMC*, NY, UC). San Bernardino Co.: Dry Morongo Creek, 6 Apr 1933, Dunkle 3411 (RSA); Santa Ana River Canyon, 3 May 1919, Munz, Street \& Williams 2672 (POM); Hwy. 330 ca. 3 mi E of Highlands, 27 May 1990, Spellenberg 10208 (NMC, NY, UC); Collius Valley, Indian Canyon, 28 Apr 1920, Jepson 8859 (JEPS); Fallbrook, 15 May 1920, Munz \& Harwood 3900 (RSA); San Diego, Chollas Valley, 1 Jan 1884, Orcutt 219 (MO). San Luis Obispo Co.: summit of Cottonwood Pass, 1 May 1949, Hoover 7644 (CAS); Escondido, 5 Jun 1904, Chandler 5332 (DS, GH, UC) (cited in new combination of M. tenuiloba var. polyphyllaz; 3 mi S San Clemente, 19 Mar 1966, Wallace 176 (SD); Otay Lake, 12 Apr 1981, Werff 4221 (SD); Cuyamaca Mts., 6 mi below Alpine, 20 Mar 1926, Wiggins 2054 (SD); Camp Kearney Mesa, 7 Apr 1935, Youngberg 7 (POM). Santa Barbara Co.: Santa Barbara Island, Cat Canyon, 4 May 1963, Blakley 5657 (US*); toward Figueroa Mtn., 4 Apr 1986, Bourell, Patterson \& Timbrook 2938 (CAS); Santa Cruz Id., 17 May 1962, Breedlove 2874 (DS); Santa Cruz Id., 9 Jun 1930, Clokey 4923 (NY, RSA, UC); Santa Cruz Id., 16-17 Jul 1917, Eastwood 6387 (CAS); Santa Barbara Id., Cat Canyon, 19 Mar 1968, Philbrick B68-80 (RSA); W of Goleta, 20 Sep 1956, Pollard s.n. (CAS);;, Ventura Co.: 5 mi S of Filmore, 2 Apr 1958, Solbrig 2670 (NY); 2 mi E of Point Mugu, 14 Mar 1959, Thompson 1857 (CAS).

## Mirabilis laevis var. laevis

MEXICO.BAJA CALIFORNIA SUR: Magdalena Bay, 18 Jan 1889, T.S. Brandegee s.n. (GH*); E base San Lazaro Mt., Santa Maria Bay, 30 Mar 1952, Moran 3530, SD; Magdalena Bay, without date, Dr. Sung 28, UC (\#101225, mounted on sheet with M. laevis var. crassifolia).

## Mirabilis laevis var. retrorsa

MEXICO. BAJA CALIFORNIA: Sierra Juárez, Arroyo el Toruno, 17 Mar 1968, Moran 14842 (ASU, RSA); Cañon de Guadalupe, $3209^{\prime} \mathrm{N} 11548^{\prime} \mathrm{W}, 23$ Mar 1986, Thorne, Boyd, et al. 61758 (RSA); San Matias Pass, 6.2 mi E of Ejido San Matias, 20 Apr 1985, Thorne and Charlton 60220 (RSA). U.S.A. ARIZONA.
Mohave Co.: road from Chloride to the river, 13 May 1931, Eastwood 18313 (CAS*). CALIFORNIA. Inyo Co.: Panamint Range, Emigrant Springs, 6 Apr 1935, Clokey \& Templeton 5725 (POM, NY, UC); White Mts., Silver Canyon, 1 Jun 1933, Duran 3455 (CAS, POM, RSA); Panamint Mts., Surprise Canyon, 13 Jun 1930, Ferris 7988A (DUD, UC); ca. 25 air mi S of Olancha at Little Lake, 8 Jun 1979, Henrickson 18257 (NMC); ca. 25 air mi SSE of Olancha, 12 Jun 1979, Henrickson \& Bekey 18288 (NMC, NY); Death Valley, S end, Bradbury Well, 9 Apr 1940, Munz 16449 (POM, UC); Eureka Valley along Big Pine road, 13 May 1962, Reveal \& Reveal 50 (NY); ca. 25 air mi S of Olancha at Little Lake, 8 Jun 1979, Henrickson 18257 (NMC); Darwin Falls Canyon, 30 Apr 1937, Train s.n. (DUD - 258204); Death Valley Natl. Mon., 25 Mar 1947, Wiggins 11529 (DUD, UC). Kern Co.: Red Rock Canyon, 1 May 1927, Abrams 11877 (POM); butte S of Mojave, 25 Mar 1932, Benson 3136 (POM); 2 mi E of Weldon, 12 May 1933, Cole \& Voegelin 120 (UC); Mojave, 12 May 1913, Eastwood 3200 (POM); Mojave - Randsburg region, 0.5 mi W of Big Bend, 1 Jun 1962, Twisselman, 7280 (CAS); near Searls P.O., 8 May 1906, Hall and Chandler 6882, 6884 (UC); California City land development land, 10 Apr 1974, Holmgren \& Holmgren 7697 (NMC, RSA); Kernville, 20 May 1962, Howell 37115 (CAS); NE of Lake Isabella, 12 Jul 1962, Howell 38667 (CAS); Red Rock Canyon, 13 May 1930, Peirson 8900, (POM, RSA); Sierra Way on N side of Lake Isabella, 5 km E of junction with Calif. Hwy. 178 at Bella Vista, 19 Jun 1996, Spellenberg 12342 (NMC*, NY); Cache Creek, ca. 0.5 mi W of Big Bend, 1 Jun 1962, Twisselman 7280 (CAS). Los Angeles Co.: Palmdale, May 1925, M. \& E. Epling sn, (MO); Lovejoy Buttes, 17 Apr 1932, Peirson 9846 (RSA). Riverside Co.: cultivated from Munz \& Everett 16245, 26 May 1954, Balls 19406 (RSA); Morongo Valley road ca. 1 mi N of Hwy 60, 7 Apr 1951, V. \& A. Grant 15979 (RSA); Indio, 26 Apr 1906, M. E. Jones s.n. (POM); Coachella Valley, 2 Feb

1937, Winblad s.n. (CAS); N base of Eagle Mts., 12 Apr 1949, Munz 13036 (RSA); Dry Morongo Wash, NW end of Coachella Valley, 2 May 1952, Munz \& Everett 16245 (RSA) (seed source for Balls 19406); Shavers Well near Mecca, 9 Apr 1922, Munz \& Keck 4754 (POM, UC); ca. 4 mi S of Morongo Valley, 3 May 1964, Thorne 33848 (DUD, RSA); Coachella Valley, 2 Feb 1937, Winblad s.n. (CAS)., San Bernardino Co.: Kramer Junction, 4 Jun 1987, Bagley 2098 (RSA); S side Ord Mtn., 8 Apr 1988, Boyd et al. 1726 (RSA); 19 mi E of Banning, 2.3 mi NW of Hwy 62 on rd to Big Morongo Canyon, 29 May 1971, Henrickson 5557 (MO); 30 mi NNW of Barstow, N of Black Canyon, 28 May 1978, Henrickson 17348 (RSA); Newberry Mts., 7 Apr 1924, Munz \& Keck 7862 (POM); S of Death Valley Natl. Mon., Avawatz Mts., 18 May 1973, Spellenberg et al. 3151 (NMC); Granite Mts., 0.5 mi SW of Willow Spring Basin, 14 Apr 1978, Stein 12 (RSA); ca. 8 mi W of Barstow, Iron Mtn., 21 Oct 1976, Strother 1256 (UC - chromosome count by Strother reported on specimen). San Diego Co.: McCain Valley, 15 Apr 1987, Clemons \& Jonsson 1690 (SD); 6 mi E of Banner on Hwy 78, 5 Apr 1944, Gould 2248 (UC); E end Santo Rosa Mts., 14 Apr 1927, Peirson 7180 (RSA). NEVADA. Clark Co.: Las Vegas, Tuly's Ranch, 10 May 1905, Goodding 2347 (GH); Goodsprings, S end Spring Mt. Range, 10 Jun 1938 Train 1932 (NY). Esmeralda Co.: base of Montezuma Mts.W of Goldfield, 4 Jun 1919, Tidestrom 9755 (RM). Humboldt Co.: Bilk Creek Mts., SW side of Black Mts, T34N, R33E, 22 May 1987 Tiehm 11048 (CAS). Lincoln Co.: Pahranagat Valley, rd from Crystal Springs to Ash Springs, opposite Geer Ranch, 30 Aug 1938, Train 2421 (A). Lyon Co.: East Walker River Rd., ca. 55 air km SE of Yerington, 13 Jun 1996, Spellenberg 12327 (MO, NMC, NY, UC); East Walker River Rd. ca. 45 air km SE of Yerington, 13 Jun 1996, Spellenberg 12329 (NMC*, NY); 3 km W of Wellington on Nev. Hwy. 2081 km E of Douglas Co. line, 13 Jun 1996, Spellenberg 12333 (MO, NMC, NY). OREGON. Harney Co.: 14 mi S on Toole Spring Rd., E of Alvord Lake, T36S R34E, 6 Jun 1964, Holmgren \& Reveal 870 (GH, NY); Pueblo Valley, 8.5 air mi NE of Fields, T37S R34E, 6 Jun 1964, Homgren \& Reveal 870 [sic] (NY). Malheur Co.: Owyhee River canyon, 9 mi upstream from Adrian, 25 May 1989, Barneby 18303 ( $\mathrm{NY}^{*}$ ); Owyhee River, T22S R45E S3, 17 Jun 1976, Packard 76-107 (NY); Owyhee Canyon, 13 mi below dam, 15 Jun 1942, Peck 21227 (NY). UTAH. Washington Co.: Virgin River 12 mi NE of St. George, 18 May 1965, Cronquist 10110 (NY, RSA); St. George, Black Hill, 16 Apr 1942, Gould 1561 (GH); near Ft. Pierce, 14 May 1986, Higgins 16468 (NY); 5 mi E Washington, Rock Cliffs, 20 May 1933, Maguire \& Blood 4390 (GH, POM).

## Mirabilis laevis var. villosa

MEXICO. BAJA CALIFORNIA: Sierra San Pedro Martir, between Hwy. 3 and Rancho Mike, 20 May 1981, Daniel 1414 (ASU); San Borja, $2847^{\prime} \mathrm{N} 1137^{\prime} \mathrm{W}$, 20 Apr 1946, Moran 1997 (UC); 3 mi N of El Alamo, $3138^{\prime} \mathrm{N}, 11601.5^{\prime} \mathrm{W}, 30$ May 1970, Moran 17644 (RSA, SD); $\pm 25 \mathrm{~km}$ of Tecate, Kumeyaay rancho of Ha-a, $3222^{\prime} \mathrm{N}, 11630^{\prime} \mathrm{W}, 10$ Oct 1976, Moran 23774 (SD);Sierra San Pedro Martir, 1 km NE of El Socorro, $3058.5^{\prime} \mathrm{N}, 11538.5^{\prime} \mathrm{W}, 20$ Aug 1977, Moran 24540 (SD); Sierra Juárez, on road to Ojos Negros, 18.3 mi SW of Laguna Hanson, 30 May 1983, Thorne et al 55990 (RSA); Cañon de Guadalupe, $3209^{\prime} \mathrm{N} 11547.5^{\prime} \mathrm{W}$, 18-20 Feb 1984, Thorne et al. 57784 (RSA); W foothills of the Sierra de Juárez, near El Bashisha, 26 \& 27 May 1987, Thorneet al. 62452 (RSA); along road to San Matias Pass and Valle Trinidad, San Felipe Desert, 11 Nov 1967, Wiggins 20832 (SD); E of Ensenada, 2 mi W of Coyote along rd between Ojos Negros and Laguna Hanson, 5 May 1969, Wilken \& Werner 7485 (UC). BAJA CALIFORNIA SUR: Cerro del Pinto, N of Portezuelo de San Antonio, $2450.5^{\prime} \mathrm{N}, 11044^{\prime} \mathrm{W}, 21$ Feb 1970, Carter 5449 (NMC). SONORA: Quitobaquito, 19 km W of Sonoita, 10 Apr 1986, Felger \& Valenzuela L. 86-180 (ARIZ); ca. 5 mi S of Puerto Libertad, 1 Apr 1980, Spellenberg 5444 (ASU, CAS, ENCB, K, MEXU, NMC*, NY, RSA, UC, UNM, WTC); Punto Cirio, ca. 7 mi S of Puerto Libertad, 27 Apr 1962, Turner 62-2 (ARIZ); Sierra Bacha, Punto Cirio near Libertad, 18 Feb 1977, Van Devender \& Kearns s.n. (ARIZ); 19 mi NW of San Ignacio, 26 Feb 1979, Walker 79H44 (ARIZ). U.S.A. -- ARIZONA. Coconino Co.: Red Lake, 17 May 1969, Cazier s.n. (ASU). Graham Co.: Camp Grant, 2 Apr 1867, Palmer 208 (MO). Maricopa Co.: 33 32'30"W, 111 27N, 9 Apr 1983, M. Baker 4544 (ASU); Hassayampa Plain, Coyote Wash, 14 Mar 1979, Fischer 5969 (ARIZ, ASU); Sierra Estrella Regional Park, 31 Mar 1968, Pinkava 4739 (ASU, NMC); Sacaton Mts., 14 Oct 1925, Peebles, Harrison \& Kearney 463 (ARIZ). Pima Co.: Organ Pipe Natl. Mon.,

Ajo Mt., 11 Mar 1983, Daniel 2586 (ASU, RSA); Sabino Canyon, Santa Catalina Mts., 2 Apr 1928, Graham 3222 (DS); Tucson Mts., Picture Rocks Pass, 17 Apr 1977, Van Devender et al. sn (ARIZ); ca. 6 mi NW of Sells, 10 Apr 1973, Spellenberg 2982 (NMC*, NY); Pinal Co.: SE Sierra Estrella, 23 Feb 1983, Rea 290 (ARIZ, SD). Yuma Co.: W side Plomosa Mts., 27 Mar 1981 Butterwick \& Hillyard 7043 (ASU, CAS); SE side of Tinajas Altas Mts., Borrego Canyon, 16 Jun 1992, Felger \& Broyles 92-614 (ARIZ); Palm Canyon, 8 Oct 1977, Harrison 11 (ASU); Tule Tank, 23 Mar 1935, Kearney \& Peebles 10890 (ARIZ, GH); Kofa Mts., Palm Canyon, 19 May 1976, Reeves \& Lehto L20124 (ASU). CALIFORNIA. Fresno Co.: Alcalde Canyon, 12 Jun 1938, Eastwood \& Howell 5839 (CAS); Coalinga-San Lucas Rd. 2.5 mi W of Coalinga, Alcalde Canyon, 28 May 1941, Ferris \& Bacigalupi 10350 (UC). Imperial Co.: ca. 20 mi NW of Winterhaven, 26 Mar 1973, Higgins 6378 (NMC, NY); Jacumba Mts., 29 Mar 1974, Holmgren \& Holmgren 7539 (NMC, NY); Chocolate Mts., 8 Apr 1949, J. \& L. Roos 4182 (RSA); E side Chocolate Mts., 11.3 mi NW of Beal Well, 25 Mar 1941, Wiggins 9648 (GH, UC). Inyo Co.: Panamint Canyon, 15 May 1906, Hall \& Chandler 7023, 7024, (UC); Westgard Pass, 18 Jun 1963, Lloyd 2636 (NY, UC); White Mts., Silver Canyon, 27 Jun 1963, Lloyd 2866 (NY); White Mts., Silver Canyon, 7 Jun 1961, Mooney, Andre \& Wright 132 (DS); White Mts., Cottonwood Creek, 18 Jul 1988, Morefield 4800 (NY);Death Valley Natl. Mon., 1 mi SE White Top Mtn., 3 Jun 1982, Peterson 566 (RSA); Darwin Falls Canyon, 30 Apr 1937, Train s.n., (DS-258167). Kern Co.: Cedar Canyon, Bedell 74-5,11 Jul 1962 (CAS); E side of Walker Pass, 21 May 1962, Howell 37226 (CAS); McClure Valley (near Kings Co.line), 4 May 1933, Keck 2158 (DS); 9 mi N of Ricardo, 5 May 1932,Munz 12465 (UC); Temblor Range, Ross Ridge, 4 Jun 1963, Twisselman 8377 (CAS, RSA). Los Angeles Co.: 4 mi S of Gorman, 21 Jun 1978, Gustafson 1025 (RSA); San Gabriel Mts., Arraster Creek, 10 May 1919, Peirson 1853 (RSA); Mint Canyon, 16 Jun 1918, Peirson 5356 (RSA); San Gabriel Mts., Little Sycamore Campground, 30 Jun 1971, Thorne \& Tilforth 40843 (RSA). Mono Co.: ca. 3 mi W of Benton Station, 31 May 1935, Robinson \& Lindner c57 (RSA). Riverside Co.: N end Palen Mts., 10 Mar 1988,Boyd et al. 2112 (RSA); Banning, 6 May 1945, Cooper 2257 (RSA); N base of Eagle Mts., 12 Apr 1949, Munz 13037 (RSA); 2 mi SE Desert Center, 26 Mar 1966, Roos s.n. (RSA). San Bernardino Co.: Providence Mtns, 9 mi E of Mitchell Caverns Rec. Area, 7 May 1988, Charleton \& Pitzer 1834 (RSA); Horsethief Canyon, 5 Jun 1935, Clokey \& Anderson 6603 (NY, POM, RSA, UC); N Kingston Mts. 2 mi SW of Tecopa Pass, 13 May 1974, Henrickson 14004 (RSA);Shay's Well, Mojave Desert, 14 May 1941, Jepson 5957,5959 (JEPS); Cushenberry Springs, 14 Jun 1927, Munz 10930 (DS, POM); San Bernardino Mts. and E base, 16 Jun 1894, Parish 3183 (NY);Hwy. 1812 mi SW of Victorville, 27 May 1990, Spellenberg 10205 (NMC,NY, UC); near Hesperia, 27 May 1990, Spellenberg 10206 (NMC*, NY, RSA, TEX, UC); Morongo Valley, 14 Apr 1971, Tilforth \& Dourley 340 (ASU, RSA); Granite Mts., Snake Spring area, 18 May 1975, Tilforth \& Tilforth 1012 (RSA).
San Diego Co.: Vallecito Wash 30.5 airline mi NW of Ocotillo, 26 Mar 1973, Holmgren \& Holmgren 6535 (NY); walls of Box Canyon, W. Colorado Desert, 2 Apr 1932, Munz \& Hitchcock 12046 (MO, UC).
San Luis Obispo Co.: just E of summit of Cottonwood Pass on St. Hwy. 41, 24 May 1955, Bacigalupi
et al. 5205 (DS). NEVADA. Clark Co.: Sheep Mts., Hidden Forest, Deadman's Canyon, 30 Jun 1940, Alexander \& Kellogg 1811 (GH); 43 air mi S of Mesquite, mts. S of Virgin Mts., Hell's Kitchen, 8 May 1975, Holmgren \& Holmgren 7926 (NY); Newberry Mts., Hiko Spring, 11 Apr 1938, Train 1377 (NY). Lyon Co.: East Walker Road E., ca. 24 air km SE of Yerington, 13 Jun 1996, Spellenberg 12331 (NMC); Nev. Hwy. 20813 km ENE of Smith at E entrance to Wilson Canyon along West Walker River, 13 Jun 1996, Spellenberg 12332 (MO, NMC*, NY). Nye Co.: 10 mi SW of Beatty above Buck Springs, 27 May 1945, Maguire \& Holmgren 25913 (GH, NY). UTAH. Washington Co.: Bulldog Knolls, T43S R18W S28, 30 Apr 1986, Welsh and Baird 23706 (NY).

## Mirabilis oligantha

MEXICO. BAJA CALIFORNIA: Cataviña arroyo ca. 5 km N of Santa Ynez, 6 Jun 1974, Carter \& Dempster 5865 (NMC); Cataviña, 23 Mar 1932, Harvey 501 (US); Cataviña Mesa, 22 Apr 1952, Gentry \& Fox 11731 (LL**);Cataviñacito, 29 44́N, $11445^{\prime} \mathrm{W}$, 21 Nov 1976, Moran 23808 (SD*); 1 mi S of Las Arrastras, 25 Mar 1960, Wiggins \& Wiggins 15940 (ARIZ,TEX*); E of El Marmol on trail to Gulf, 14 Feb 1935, Shreve 6845 (ARIZ); 10.1 mi (by road) N of Bahía San Luis Gonzaga, 6 Oct 1967, Hastings \& Turner 67-10 (ARIZ,

SD); Sierra de Volcán 4 mi E of El Marmol, 13 Feb 1935, Wiggins 7571 (UC); Rancho Cataviña, 35 mi S of El Marmol, 8 Mar 1930,Wiggins 4406 (UC); San Francisquito Wash, 18.7 mi (by Road) SW of Bahía San Luís Gonzaga, 12 Oct 1963, Hasting \& Turner 63-158 (ARIZ). BAJA CALIFORNIA SUR: Picachos de Santa Clara, 5-10 Nov 1947, Gentry 7717 (ARIZ)

## Mirabilis oxybaphoides

MEXICO. CHIHUAHUA: Ca. 23 air mi ENE of Villa Ahumada, 12 Sep 1973, Henrickson 12849 (NMC). COAHUILA: Arteaga, C. Los Camargos, 4 Aug 1980, Hinton et al. 17926 (CIIDIR); Sierra del Pino, western ridge, W of camp at La Noria, 24 Aug 1940, Johnston \& Muller 603 (GH*, LL,TEX); Cañon de Calabasa, N wall of Sierra Mojada, 27 Oct 1941, Stewart 2209 (LL,GH). NUEVO LEON: Hacienda Pablillo, Galeana 5 Aug 1936, Taylor 93 (TEX);Dist.Zaragoza,Puerto Pino, 19 Jun 1979, Hinton 17556 (TEX); Dist. Arteaga, Canyon de Los Amargos, 4 Aug 1980, Hinton 17926 (CIIDIR, TEX); Mcpio. Galeana, W slope Potosí, 29 Jun 1983, Hinton et al. 18491 (GH,TEX). U.S.A. ARIZONA. Apache Co.: Canyon de Chelly Nat'I.Mon., 2 Sep 1972, Halse 811 (ARIZ); ca. 1 mi N of Nelson Reservoir (SE Eager), 20 Sep 1975, Lehto et al. 19057 (ASU, NMC); Little Colorado River, 0.15 mi S of jct AZ Hwy. 260 along AZ Hwy 273, around bridge over river, 30 Aug 1988, Ricketson \& Raechal 4364 (ASC, MO, NY, RSA, TEX, UC). Cochise Co.: Cedar Gulch, Paradise, 30 Sep 1907, Blumer 2241 (GH);Dragoon Mts., N side of Mt. Glenn, 9 Sep 1983, Daniel 3148 (ASU). Coconino Co.: Colton Ranch, field 1, 24 Aug 1957, McDougal s.n. (ARIZ); Sycamore Canyon Wilderness Area, 11 Oct 1969, Pinkava et al. 5855 (ASU); 6 mi S of I-40 at Meteor Crater, 3 Sep 1981, R.\& D. Sauleda 6438 (ASU). Navajo Co.: Chuska Mts., E of Fort Defiance on ridge W of Coal Mine Wash, 12 Sep 1977, Spellenberg 4893 (NMC). Yavapai Co.: Mingus Mountain, 3 Sep 1968, Keil 3823 (ASU). COLORADO. Chaffee Co.: near junction of highways 285 and 291 NW of Salida, 20 Aug 1954, Waterfall 12142 (TEX). El Paso Co.: W side of Colorado Springs at entrance to Queen's Canyon, S27 T13S R65W, 6 Jul 1996, Kelso \& Maentz 96-32 (NMC); W of entrance to Garden of the Gods, 14 Aug 1954, Waterfall 12040 (TEX). Montezuma Co.: lower Spruce Canyon near jct. with Navajo Canyon, 17 Sep 1947, Weber 3629 (ARIZ, NMC, TEX). Montrose Co.: Dolores River Canyon, 7.1 mi S of Sinbad Valley Rd.,T49N, R18W, S34, 29 Aug 1985, Franklin 2489 (GH). Ouray Co.: W of Ridgeway, 20 Aug 1920, Payson 2308 (GH). San Miguel Co.: Norwood Hill, 20 Aug 1912, Walker 508 (GH). NEVADA. Clark Co.: Charleston Mts., Little Falls, 3 Aug 1935, Clokey 5454 (GH). NEW MEXICO. Catron Co.: 14 mi SW of Horse Springs, vic. Bat Cave, 19 Aug 1948, Smith 208 (ARIZ, GH); Forest Rte. 95, Whitewater, 24 Sep 1972, Tays GT-18 (ARIZ). Cibola Co.: Ramah Navajo, 22 Aug 1939, Vestal \& Vestal 56 (ECON), 10 Sep 1939, Vestal \& Vestal 408 (ECON). Colfax Co.: Philmont Scout Ranch, near Cimarron, South Ponil Canyon, 1 mi E of Pueblano Camp, 5 Aug 1968,Hartman 2605 (TEX). Doña Ana Co.: S end Organ Mts., 24 Oct 1971, Spellenberg 2738 (NMC); Organ Mts., 4 Sep 1897, Wooton 587 (ARIZ). Grant Co.: Bear Mountain, near Silver City, 15 Sep 1903, Metcalfe 696 (ARIZ,GH, NMC); ca. 5 air mi NW of Silver City on Bear Mountain, 6 Sep 1980, Spellenberg \& Soreng 5858 (NMC, NY) (chromosome count by D. Ward). Lincoln Co.: near Gray, Aug 1898, Skehan 103 (GH); Oscura Peak, 26 Aug 1988, Spellenberg et al. 9681 (MO, NMC, NY). Luna Co.: summit of Cooke's Peak, 20 Sep 1986, Columbus 637 (NMC*). Otero Co.: ca. 5 air mi ENE of Alamogordo at High Rolls, 16 Sep 1988, Spellenberg \& Ward 9728 (NMC, NY). Sandoval Co.: Sky Village, S22 T14 R1W, Oct 1974, Blankenhorn 214 (ARIZ). San Miguel Co.: 18 mi E of Las Vegas, M. E. O'Connor Trust Ranch, 2.8 mi S of Rte. 104, Mogote Trap, near gate to Crystal Pasture, 21 Aug 1982, Hill \& Levandoski 12161 (GH); near Pecos, 18 Aug 1908, Standley 5063 (NMC).
Santa Fe Co.: north of Glorieta, 24 Aug 1908, Standley 5255 (NMC). Sierra Co.: Kingston, 5 Oct 1904, Metcalfe 1459 (GH, NMC); W face of Caballo Mts. 8.6 mi by winding road E of Caballo Dam on Rio Grande, 8 Sep 1974, Spellenberg 3936 (LL,NMC). Taos Co.: between Amalia and Ute Springs, 14 Aug 1973, Holmgren \& Holmgren 7169 (ASU, NMC). TEXAS. Brewster Co.: Chisos Mts., 23 Aug 1931, Mueller 7994 (GH); Big Bend National Park, Lost Mine Peak, 12 Sep 1961, Correll \& Johnston 24516 (GH*, LL). Chaffee Co.: near junction of highways 285 and 291, 20 Aug 1954, Waterfall 12142 (TEX*). Culberson Co.: Guadalupe Mts. Nat'I. Pk., Shumard Canyon, 29 Sep 1973, Burgess 1631 (ASU); Guadalupe Mts. Nat'I Park, Bear Canyon trail to The Bowl, 16 Sep 1974, Burgess 2657 (ARIZ). Presidio Co.: Sierra Tierra

Vieja, ca. $1 / 2$ mi S of Vieja, 4 Oct 1941, Hinckley 2184 (ARIZ, GH). UTAH. Wayne Co.: Aquarius Plateau, Utah 117 _ mi S of Grover, T30S, R5E, S2, 19 Aug 1965, Holmgren et al. 2548 (TEX).


#### Abstract

Mirabilis tenuiloba MEXICO. BAJA CALIFORNIA: along trail from Guadalupe Cyn to Laguna Hanson, $3210^{\prime} \mathrm{N}$, $11542^{\prime}$ W, 13 Mar 1988, Clemons \& Jonsson 1999 (SD); canyon 3 mi from Bahia de Los Angeles village toward San Borja, 17 Feb 1963, Cowan 2321 (CAS, GH, SD); Cocopa Mts., 22 Apr 1949, Gentry 8712 (ARIZ, RSA, SD); first large canon W of Punta Diablo, 25 Mar 1959, Moran 7251 (DS, SD); 29 mi N of San Luis Gonzaga, $3008^{\prime}$ N, 114 40'W , 20 Apr 1960, Moran 8211 (SD); S end of North San Lorenzo Island, 24 Mar 1962, Moran 8877 (CAS, SD); ca. 6 km SE of Puerto Refugio, 17 Mar 1977, Moran 23949 (SD);Los Angeles Bay, Dec 1887, Palmer 600 (GH,UC) (paratype of Hesperonia polyphylla); 41.6 mi S of Mexicali, 22 Mar 1970, Powell \& Turner 1708 (TEX, US*); Puerto Refugio, Punta Norte de la Isla Angel de la Guarda, 7 Feb 1986, Tenorio L.\& Romero deT. 10836 (RSA,TEX); Bahia de los Angeles, 12 Feb 1962, Wiggins \& Thomas 238 (US); 3/4 mi S of Puertocito, 21 Mar 1963, Wiggins \& Wiggins 15863 (ARIZ, DS, GH, TEX, US*); Arroyo la Bocana near Rancho Santa Ynez, 13 Mar 1991, Van Devender et al. 91-410 (ARIZ, NMC). BAJA CALIFORNIA SUR: San Marcos Island, 23 Apr 1952, Moran 3975 (UC); 29 Mar 1962, Moran 9005 (SD); Carmen Id., Marquer Bay, 5 Apr 1962, Moran 9199 (RSA, SD, UC); 1 mi S of Mission Los Dolores, $2505^{\prime}$ N, $1105^{\prime}$ W , 4 Dec 1959, Wiggins, Carter, \& Ernst 258 (UC). SONORA: Isla San Esteban, N side, 10 Apr 1968,Felger et al. 17573 (ARIZ,RSA,SD, UC);Sierra de Rosario,Gran Desierto, 10 Mar 1973,Felger 20652 (ARIZ, SD). U.S.A. ARIZONA. Yuma Co.: SE side of Tinajas Altas Mts., Borrego Canyon, 16 Jun 1992, Felger \& Broyles 92-613 (ARIZ, ASU, MO, RSA, TEX, UC); Tinajas Altas Mts., 7 Mar 1940, Goodding s.n. (ASU). CALIFORNIA. Imperial Co.: Colorado Desert, Coyote Wells, Apr 1905, Brandegee s.n. (US*); Coyote Wells, 16 Apr 1983, Jonsson \& Clemons 472 (SD); Painted Gorge, 8 Apr 1941, Peirson 13075 (DS, RSA); In-Ko-Pah Mtns. along Hwy. 98, 5 Mar 1966, Wallace \& Wilkin 110 (RSA). Riverside Co.: Devil's Canyon above Coral Reef Ranch, 23 Feb 1931, Ewan 4036 (CAS);West Cañon, western edge of the Colorado desert, 18 Apr 1907, Parish 6072 (GH, NMC, TEX) (acc. to Parish's note, a topotype); Deep Canyon Wash, 11 Apr 1922, Peirson 2917 (RSA); Deep Canyon drainage, S side lower Pipistrelle Canyon wash, 29 Mar 1973, Zabriskie and Zabriskie 594 (RSA). San Diego Co., Palm Canyon, Borego Valley, 17 Mar 1940,Ramsey \& Ramsey s.n. (POM); Borego Desert, canyon, toward the Palms, 24 Mar 1939, A. \& R. Nelson 3236 (DS); Borego Palm Canyon, 14 Apr 1936, Gander 1301 (SD).


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